COMPUTERWORLD

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Politics '72

GOP Plank Falls Short on Privacy

MIAMI – The Republicans have joined the Democrats in deploring the idea of a National Data Bank, but the Republican platform adopted here last week stops far short of the Democratic views on the issue of privacy.

"We will continue to defend the citizen's right to privacy in our increasingly interdependent society," the Republicans pledged, adding: "We oppose computerized national data banks and all other 'big brother' schemes which endanger individual rights."

The issue of privacy and misuse of data in computerized files could become an issue in this campaign, some sources have predicted, with the Democrats hitting hard at the past record of the Nixon Administration [CW, July 12].

While the Democrats, in their platform last month, had called for access to all government and commercial data files maintained on individuals by those individuals, the Republican platform plank contains no mention of the citizen's right to inspect and correct his own files.

In addition, the Democrats stated that "collection and maintenance by federal agencies of dossiers on law-abiding citizens, because of their political views and statements, must be stopped, and files which never should have been opened should be destroyed."

The Republican platform contains no such mention.

Since the Democrats have taken a much tougher stand on the issue of personal privacy in computerized data banks, several sources said the Democrats would be looking carefully for any alleged abuses in governmental data systems in order to seize on an issue to embarrass the Nixon Administration.

On the Inside This Week

Prof. Arthur Miller suggests that computer files of one company, if organized by Social Security number, would tempt other companies or the government to "dip in" and correlate non-related data.

CW Photos by Edward J. Bride

Willis Ware, deputy vice-president of the Rand Corp., and Guy Dobbs, vice-president of Xerox Computer Services, listen intently as California state Sen. Stanley Aronoff questions witness. All are members of an HEW advisory committee investigating the extent of Social Security number use in computer files.

Witnesses Foresee UID

Panel Warned of SS Number Trend

By Edward J. Bride
Of the CW Staff

BETHESDA, Md. – It may be too late to stop the trend toward the use of the Social Security number as a universal identifier (UID), a government advisory committee was told here recently.

While no conclusions have been reached yet, many witnesses before a committee formed by Secretary Elliott Richardson of the Department of Health, Education and Welfare (HEW) have described planned or already implemented computer files with the SS number as chief file access.

The committee is studying the various implications of this trend, including invasions of privacy and possible infringement of "due process," caused by a common key to many computer data banks.

Several witnesses have expressed the belief that individual account numbers for credit or other files should be eliminated, and the SS number used to access all records.

The report is expected to include conclusions on the extent of computerization of data on individuals by SS number and possible standardization of files, plus reports on the need to protect consumers and assure accuracy and privacy.

The 25 members are trying to balance the advantages – specifically to computer users – of a UID against possible invasions of privacy.

Legislation for privacy and accuracy standards, controls over system interfaces, possible redress when basic liberties are infringed through use of the SS number and public policy on secondary uses of collected data are all within the committee's purview.

The Social Security Administration is a branch of HEW, and officials have tried to discourage computer users from using the SS number for identification, witnesses have reported.

(Continued on Page 4)

Itel Unpacks Fixed Head Files, Controller for VS

By E. Drake Lundell Jr.
Of the CW Staff

SAN FRANCISCO – Users planning on moving to the new IBM virtual memory machines – and others with requirements for high performance direct access storage – now have an independent source for 2305-compatible fixed head disk systems.

Itel last week announced a 7305-2 fixed-head file plug-to-plug compatible with the IBM 2305-2; a 7305-3 file that offers slightly lower performance; and a 7835 control unit, which is compatible with the IBM 2835 control unit promising to offer increased performance.

The Itel controller allows 360 and 370 users to mix both 3330-like and 2305-type fixed-head disks in one system while IBM requires separate controllers. In addition, one of Itel's fixed-head disk systems will operate on the 360/65 and the 370/135.

Major Features

The major features of the Itel system unavailable with the IBM units include a provision to allow the user to attach up to four fixed-head files on one controller, while the IBM controller can handle only two of the files.

In addition, the 7305-3 can be attached to any 360/65 or higher and the entire 370 line, while the IBM unit is available only for the 360/85 and up and 370/145

(Continued on Page 2)

Magnets: a Surface Issue

By a CW Staff Writer

MENLO PARK, Calif. – Magnets definitely can cause severe damage to magnetic computer tapes, but there are much simpler ways to sabotage a computer installation, according to a researcher who has recently finished a several month study of the problem.

At the same time, W.D. Tiffany, manager of the security systems research program at Stanford Research Institute (SRI) here, still maintains the danger of having an entire tape library wiped out by an intruder with a concealed magnet is greatly exaggerated [CW, Feb. 16].

In a research project, Tiffany said no users could provide him with documented cases where concealed magnets affected their tapes.

A common "dime store" magnet, he said, could cause degradation in the tape and erase portions of it if it were held directly against the tape surface.

But tapes kept in canisters will have few problems with this type of magnet, he said, since the space between the tape and the canister would be large enough to prevent damage from the magnetic field.

Several people in the security field, however, have challenged Tiffany's findings.

'Very Real Danger'

"There is a very real danger of tape destruction by magnets carried into a computer room and/or tape library," according to L. Conroy, director of Securi-

(Continued on Page 2)

★ Special Report: The Mighty Minicomputer... Follows Page 16

Kiewit Head Cites Similarities

Interactive, Batch—a Vanishing Line

By Ronald A. Frank
Of the CW Staff

HANOVER, N.H. – The distinctions which may have existed between batch and interactive computer communications systems are rapidly disappearing.

All batch systems now have an interactive or time-sharing component and most interactive systems can do batch jobs, according to Professor Thomas Kurtz, director of the Kiewit Computation Center at Dartmouth College.

Reliable communications is equal in importance to reliable computer equipment in any system, Kurtz said. "It is at least as difficult to bring the information to the computer as it is to provide the processing service," he stated in an interview with *Computerworld* here.

The man-machine interface occurs at some point in each system and this interface should be as convenient to the user as possible, Kurtz continued. Many cost studies comparing different types of computer systems don't take into account the "people time" involved in getting ready to use a computer, he added.

The punched card will eventually disappear except as a medium for specialized input, according to Kurtz. It certainly will drop out of use as a device for intermediate storage. A case in point is that many users no longer utilize punched cards for file storage, he added.

"We're already going from keyboard to tape. Once you do that it is simple to put a telephone line through to the remote site," he said.

Kurtz thinks reliability and price are the two most important factors in a terminal. "We are already hovering in the $1,000 to $3,000 range for fairly sophisticated keyboard-type terminals," he said.

While the concept of interactive terminals in the home sounds attractive, Kurtz questions whether the lives of most people are really geared to continuous information gathering.

"What would a home terminal tell me about my bank account that I don't already know?" he asked. A terminal that supplies a daily printout of a bank balance would be unnecessary in most households, Kurtz noted.

"A home terminal would have to be really cheap before most people would want to buy it," he said. "I don't see the home computer terminal in some highly involved form taking its place beside the television set."

Higher-Level Language

Asked about the need for a higher-level programming language designed specifically for data communications, Kurtz said most of this work is done in machine language at Dartmouth. "In the Datanet-30s we have an exact count of the machine cycles. The software is precisely counted. If it takes 972 memory accesses to run a piece of code, we know that."

A special language for communications may not be needed since few changes are involved in most networks once they are up and running, he stated.

As one of the developers of Basic along with Dartmouth President, John Kemeny, Kurtz said efforts by Ansi to develop standards for the language are progressing slowly.

At present an ad hoc committee is still working on a report recommending the standards project be undertaken, he said.

CW Photo by Ronald A. Frank

Thomas Kurtz

It will take at least two to three years after work begins to develop Basic standards, he predicted.

"It appears the manufacturers are interested in establishing standards to implement the language on small machines," he said. There is an argument for the standardization in terms of educational uses, he said, but software transferability with Basic is not as important as it is with Fortran or Cobol. The transferability question is complicated and not well understood, he said.

Core Standard

"My hope is that there will be a core standard and, in addition, something wider," he said. But it may already be too late "to get a grip on the file system interfaces because of the many versions that already exist," he said. "In many cases we now have a de facto standard. Many have copied the Dartmouth version."

IBM is focusing its attention on data security because this is a serious problem for IBM, he noted. With OS any user can get at any point in the file system. He issues direct commands without going through a validation process.

It will cost IBM $30 million to $40 million to build validation procedures into user structures and file structures within OS, he estimated.

But for most users, "the security of data is no longer a serious problem," he said. "The security that we have on our system is quite sufficient and nothing additional is needed," he said.

Magnets and Tapes May Be Just a Surface Issue

(Continued from Page 1)

tronics.

Conroy reported he had run magnets of relatively small size (250 Gauss to 1000 Gauss) over the plastic housing and metal containers with tapes in them.

"We were able to cause sufficient damage to make the tapes useless," he claimed. "They were not wiped out in the meaning that they were erased; however, the damage was just as effective."

Touch Tape Surface

Tiffany said his laboratory experiments showed a magnet of 250 Gauss would definitely affect a tape if the magnet were held on the surface of the tape.

But, he said, if a magnet of that strength were moved 1/8th of an inch away from the tape – the space he said equals that of the typical canister – there would be no noticeable effect on the tape.

A regular file cabinet, he said, would similarly protect tapes from anything but a "horrendous" magnet.

At the same time, Tiffany reported that a poor tape or one that was dirty or similarly mistreated would be damaged more readily than a clean tape treated properly.

A saboteur planning to damage the tapes in a DP center could not do it by just standing in the middle of the computer room or the tape library with a small magnet in his pocket, Tiffany said. He would have to run the magnet over the surface of the tape.

Because of this, it would be extremely difficult for an intruder to secretly wipe out all the tapes in a center, he said. "After all," he added, "some centers have thousands of tapes – it would be a huge job to wipe all of them out."

While the danger does in fact exist, Tiffany said, it has been exaggerated. An installation need only keep its tapes in good shape, in their canisters and in file cabinets to be assured against tape erasure by someone just carrying a magnet into the DP center.

At the same time, if the center were invaded by individuals intent on destroying the tapes, they could do it just as effectively without magnets, he indicated.

Or if an operator planned to damage the tapes, it would be far easier for him to erase the tapes as they were being used than to place a magnet against each tape in the library.

The best protection against these threats, he said, is to keep tapes clean and properly filed, to limit access to the computer center and to carefully check out employees working in the center.

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FBI Has Big Day, But Only One 'Hit'

WASHINGTON, D.C. – The FBI computer batted three-for-three recently, but came up with only one "hit."

Officials in Denver were checking a pistol which had been located in a pawn shop, and discovered what was apparently three different serial numbers.

Inquiries were made to the National Crime Information Center on all three numbers, the ones on the frame, the slide and the barrel bushing.

The number on the slide had been entered over two years ago by New Orleans police; the numbers on the barrel bushing and frame were entered last March and April, respectively. What the officials had recovered was a "cannibalized" pistol, made of parts of weapons taken in three different house burglaries.

Muscle Functioning Tested

PROVIDENCE, R.I. – A Brown University research team is trying to develop a simple clinical test to provide numerical data from which a computer can distinguish between normal and abnormal nerve and muscle functioning.

The team is working to improve its computer model, refine the mathematical techniques and develop a test which can be performed easily in a clinic.

Itel Unpacks Files, Controller

(Continued from Page 1)

and higher.

Another feature permits the user to attach both 2305-like fixed head files and 3330-like disk units to one 7835 Itel controller either separately or simultaneously.

The 7835 controller is the star of the entire new product range.

The model designed specifically to replace the IBM 2835 is priced 10% below the IBM unit, but the features that can double the capacity bring the cost to about equal the IBM price.

The basic unit, directly compatible with the IBM 2835, costs $1,890/mo on a two-year lease, compared with the IBM cost of $2,100/mo on a two-year extended-lease plan.

By adding a 3-drive address feature, first announced by Itel with its 7830 controller, the user can handle up to four of the 2305-compatible drives – doubling the controller capacity – for an additional cost of $170.

This feature also permits the user to intermix 3330-like disk drives with the 2305-type drives on one controller.

For example, Itel said a user could attach up to eight 3330-like spindles and two 2305-type drives to one 7835 controller, an application the firm said would be particularly effective with 360s.

The 7305-2 is designed as a direct replacement for the IBM 2305-2, but costs about 10% below the IBM unit.

Both offer a storage capacity of 11.2M bytes, a data transfer rate of 1.5 Mbyte/sec, a rotational speed of 6,000 rpm, and an average access time of 5 msec or within a maximum of 10.2 msec.

On a two-year lease plan the Itel 7305-2 costs $2,945/mo, compared to the IBM price of $3,276/mo for the 2305-2 on a two-year extended-lease plan.

Lower Performance Unit

The 7305-3 is a lower performance unit than those offered by IBM, but is said to offer users better price/performance in many applications, according to Itel spokesmen.

The unit has a capacity of 11.2 Mbytes, but since it operates at only 3,600 rpm, the data transfer rate is slowed to .9 Mbyte/sec, for an average access time of 8.3 msec.

The unit will rent for $2,030 on a two-year plan, compared to the IBM price of $3,276 for the 2305-2 on the two-year extended-lease plan.

The 7305-3 can be used with the 360/65 and higher, giving 360 users the advantages of the fixed-head files in applications such as storage extension, programming system residence and table or index storage.

All of the products will be available in the third quarter of 1973.

Clarification

The price increases on Univac 1700 Series buffered keypunches [CW, Aug. 9], effective July 1, were announced in January.

Witnesses See SS Number as UID

(Continued from Page 1)

While the Social Security card specifically states that the number is not to be used for identification, there is no legislation to this effect, according to David B.H. Martin, special assistant to Richardson and executive director of the committee.

Legislation for privacy and accuracy standards, controls over system interfaces, possible redress when basic liberties are infringed through use of the SS number and public policy on secondary uses of collected data are all within the committee's purview.

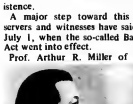
The Secretary's Advisory Committee on Automated Personal Data Systems has heard witnesses call the SS number the one number in wide use, easily remembered or accessible by individuals, and unlikely to change because of marital, dependency or mobility status.

These traits were cited by witnesses as desirable, if a standard UID is to be adopted by the government and computer-using companies.

Opponents of a UID claim it could lead to a de facto national data bank, by facilitating the automatic interfacing of several smaller data banks already in existence.

A major step toward this event, observers and witnesses have said, occurred July 1, when the so-called Bank Secrecy Act went into effect.

Prof. Arthur R. Miller of Harvard, a



Weizenbaum
. . . no absolute safety

committee member and author of *Computers and Privacy*, noted that students applying for educational loans under HEW's Guaranteed Student Loan Program must apply for SS numbers because of the Bank Secrecy Act.

Under the new law, all such applications and financial transactions must be kept on file by banks, by SS number for file access. Miller said at the hearings that data on students' parents, to include their earnings and other data considered private, also become accessible to outside investigation through the loan application.

Miller agreed with Willis Ware, deputy vice-president of the Rand Corp., that it may be too late to reverse the trend. "Has the boat already sailed?" asked Ware of the UID issue.

Miller responded that the "patient is pinioned by the arms and legs," and impending welfare reform legislation, depending heavily on computers and the SS number, would be the "stake in the heart."

Miller was referring to HR-1, the legislation which would nationalize welfare. Five states are currently involved in a project to enumerate all welfare clients with SS numbers, in a prototype experiment.

The project involves smaller states, but is intended to give some idea of complications that might arise if and when HR-1 is passed.

The general public has already exhibited some resistance to disclosing SS numbers to welfare workers in Florida, according to Paul A. Skelton, administrative services director for Florida's Department of Health and Rehabilitative Services.

Skelton told committee members that drug users, alchoholics and other clients being rehabilitated were reluctant to give welfare officials their SS numbers, since information would be entered in some type of data bank."

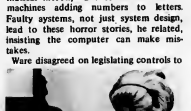
The HEW committee was urged to recommend the use of the SS number to control data, but only with proper quality control. The committee should recommend legislation to this effect, said columnist Alan Taylor, who testified as the president of the Society of Certified Data Processors (SCDP).

Taylor said that HEW should demand and inspect the controls, and "report to the public on their success or failure." Computer users cannot afford to ignore the advantages of data bases, he commented, adding public policy cannot permit inaccuracies.

When Prof. Joseph Weizenbaum said there can be no absolute safety, Taylor agreed.

Taylor called the computer a "mathematical moron," and recalled stories of machines adding numbers to letters. Faulty systems, not just system design, lead to these horror stories, he related, insisting the computer can make mistakes.

Ware disagreed on legislating controls to



Committee chairman Dr. Frances Grommers, visiting lecturer at the Harvard School of Public Health, consults with Don M. Muchmore.

the systems side of the house, and claimed Taylor was using the computer as a "scapegoat." The way to deal with computer-aided problems is to make it financially risky for companies to misbehave, Ware said.

The way you do that, he added, is to "facilitate" the public's access to corporations. Accuracy must be incorporated at the system design stages, he continued, insisting "you cannot legislate these controls."

Later in the hearings, Prof. Layman Allen of the University of Michigan suggested that a tax on the SS number usage might be one possible answer.

Committee members discussed the possibility that companies might consider more fully the use of a UID if taxation were imposed. The revenue could be used to police a UID, as well as deter frivolous uses, observers noted.

The committee also heard officials of the Indian Heath Service discuss the need for a unique identifier aside from the SS number, for a migratory population. Some Indians in a health data bank have as many as six SS numbers, an official commented.

These individuals find it easier to obtain a new number than to transfer records, officials reported. A representative of the Social Security Administration said later that, with proper cross-indexing, the multiplicity of numbers would not be a problem, and the system might still serve the needs of those in the data bank.

Harvard's Miller criticized the communications-oriented system because of the wide spectrum of people with input and output capability "far beyond the doctor."

Dr. Rice Leach, director of the Indian Health Service Unit in Sells, Ariz., agreed, but added the system was to be modified in several ways to protect the privacy of those on file. One way, Leach said, would be the removal of names and addresses from all printouts except where absolutely necessary. Another way, he said, would be the locking of printed files in separate rooms. These files include registers of aliases and confidential file number of Indians, Leach noted.

Miller was still concerned because "legally, there are all sorts of organizations that could subpoena data" in the Indian system. Administrative subpoenas are easy to obtain, Miller said, expressing concern over "official misuse" of records.

Later in the hearings, Taylor returned to criticize a recommendation that both the name and the SS number are needed for a UID. That recommendation was made by the American National Standards Institute, but Taylor disagreed with an Anal claim that an ID code alone is "not sufficient for identification."

An FBI official also testified at the hearings, and among other things said the SS number is not used as the ultimate identifier in the National Crime Information Center.

Guy Dobbs, vice-president of Xerox Computer Services, asked inspector Don Roderick if agencies tied into NCIC couldn't use hard copy for any desired use.

Roderick replied that uses had to be approved by the attorney general, but witnesses later in the hearings implied that data gleaned from the merging of several different types of files might escape regulations.

Roderick noted the chief purpose of computerizing the criminal histories is eliminating incomplete records, those which do not contain the disposition of an arrest.

While the FBI remains the central records agency, however, it is up to the entering agency, the state, to expunge records, he noted.

FBI Seen as Model

While the FBI system was only slightly criticized by Ware, Dobbs and Miller, the three most outspoken privacy proponents, Dobbs said the system is used as a model by other users.

"Local agencies tend to emulate technology" of such systems as the FBI, he noted, "but they don't give adequate consideration" to the by products, such as extensive files of sensitive data.

Miller commented that NCIC "could perform one of the magnificent functions in law enforcement today, namely the reduction of incomplete rap sheets."

During the hearings, witnesses and committee members stressed that the real concern is that large data bases often are used for other than the original intentions, and this often can be misleading.

The fact that a tax form is badly designed, and requires an extension due date – early by six months – may present no problem to the tax agency, but to a credit bureau, it would make a citizen appear to be a tax delinquent, Taylor noted.

Witnesses generally agreed that individuals should be informed of the possible secondary uses of collected data, so they could be forewarned of possible difficulties.

The three-day hearings will continue on a monthly basis until the end of the year, at which time Richardson expects detailed recommendations.

'We Could Live Without It'

BETHESDA, Md. – If large data banks of credit information are created, and organized by Social Security number, would outside organizations be tempted to "dip in?"

The question was posed by Prof. Arthur Miller, and the witness from General Electric Credit Corp. said the possibility had not been considered.

"We could live without it," said Emmet E. DeLay, referring to the SS number and its possible use as a file organizer. DeLay, manager of information systems operations at the Stamford, Conn., data center, also said the SS number is the only number on his paycheck – the company has eliminated pay numbers.

Committee member Don M. Muchmore, senior vice-president at California Federal Savings and Loan Association, claimed the use of the SS number could help ensure accuracy and deter misidentification of payroll, as well as customer account numbers.

DR Photos by Edward J. Erich

HEW advisory committee investigates the increasing use of Social Security numbers as file organizers in computer data banks.

Airline Keeps 'Travel Profile'

BETHESDA, Md. – The suspicion that some airlines are creating travel profiles of their customers was partly eliminated by a representative of Trans World Airlines, one of the largest DP users in the travel industry.

The travelers' data bank at TWA is organized only by flight number and date, with a traveler's phone number as a possible retrieval item, F.M. Wilkerson vice-president for data services, testified at the HEW Committee hearings.

Addresses or SS numbers of customers are not recorded, although travel profiles only identify frequent travelers who might be interested in changes in schedules, new services, credit cards, etc.

These frequent travelers are normally contacted by phone, Wilkerson said, and not placed on a mailing list. An exception could occur if tickets are mailed by TWA to a customer, he noted.

Robert Gallatti, a committee member and director of New York state's identification and intelligence system, questioned the TWA executive on a "guilt by association" principle.

Gallatti asked whether an investigation into airline files could lead to a disclosure that a highly placed police official was on the same flight, for example, as a top underworld figure.

While Wilkerson agreed this type of intelligence gathering was possible, he stressed that the date and flight must be the input items. There is no system in use that could indicate whether the hypothetical police official and gangland figure sat side-by-side, he added.

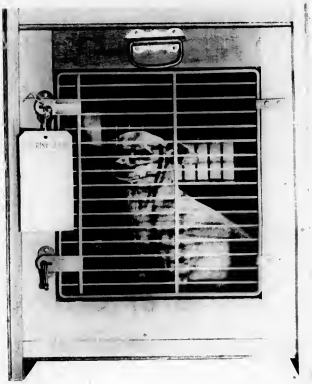
There is a chance TWA will implement such a file, he also said.

Prof. Joseph Weizenbaum objected to secondary uses of the TWA data, such as providing free access to law officials without subpoena.

Wilkerson countered: "We can cooperate, within the law, or we can wait for a subpoena, and when we wait, subpoena normally follows."

Wilkerson further stated he would not object to a proposal that the airline industry print a standard statement on all tickets informing travelers of possible secondary uses of information.

On the road, computer tape can lead a dog's life.



Far too often, tape in shipment takes a lot of kicking around. It gets shoved and bounced around inside a sweltering-hot van. Or it sits shivering on a cold, drafty warehouse dock.

Many tapes can't survive this kind of treatment. By the time they reach your EDP center, they can't remember their own names—much less retain all of the valuable data you've trusted them with.

Epoch 4 can. It's made to take rough treatment in stride. It has a binder system that's 8000% tougher than that of any other tape on the market.

Epoch 4 can withstand heat in excess of 175 degrees F. without degradation. It can take humidity with no sweat. And hold its own in cold that would make a Husky curl up in knots.

You'll have fewer worries about cinches, pleats, pack pressure and subsequent loss of data-retaining capabilities when you ship Epoch 4 tape. You have our 20-year guarantee on it.

GRAHAM MAGNETICS

GRAHAM, TEXAS 76046

Close Watch

Researchers at Ohio State University use a computer to study the effects of changes in the environment on the body. Volunteers live in an environmental chamber (above) and breathe sulphur dioxide. Vital bodily functions are measured and impulses from the instruments are transmittad to the System/7.

A Case for Centralization?

City Hit on Hiring Practice, Hardware Mix

By a CW Staff Writer

WORCESTER, Mass. – This city and its departments spend about the same percentage of its yearly budget as other municipalities on DP, but Worcester isn't getting its money's worth, according to City Auditor Guy Lapriore.

In a recent report to the City Council, Lapriore advocated the development of a centralized DP facility "as soon as possible" to replace the present, high-cost "conglomeration" of hardware which is limited in its capabilities.

City Hall is using an IBM 360/20; the school department has four IBM 1620s and an NCR 100 for educational purposes; the city hospital has an IBM 8/3; and the library has a Libe-100 dedicated mini system, Lapriore noted, adding that the public works department uses a Burroughs Sensimatic Bookkeeping Machine for water billing.

Outside Services

But Lapriore also blamed Worcester's "very undesirable" situation on the use of outside DP services purchased at "grossly exaggerated" prices, and on a general neglect of hiring and upgrading personnel to create a qualified DP staff.

He took particular exception to the school department's use of outside services, at an annual cost of approximately $118,000.

The schools could be provided comparative services by a centralized city installation for "60% to 70% less," and any added outputs or changes would be automatically absorbed, Lapriore claimed. In addition, "continuous, full-time" attention would result in better quality of the output.

The overall annual cost of all hardware rentals, outside DP services, salaries and supplies is approximately $500,000 and, in total, this is not an unreasonable figure, the council was told. But Lapriore stressed that the hardware represented 67% of that figure.

That represents the exact opposite of the prevailing nationwide pattern of DP expenditures, and that is Worcester's major problem, he said. The city not only has a bad mix of basically incompatible CPUs but also the user departments either cannot or have not hired the systems and programming personnel needed to utilize the equipment most effectively.

More Qualified Staff

By eliminating outside services and renting a high-speed, high-capacity computer, in place of some of the present units, hardware costs can be reduced enough to cover the salaries of additional qualified personnel, Lapriore said.

He noted that other cities such as Springfield, Mass., have been able to realize real financial returns on their centralized DP facilities by making services and/or time available to smaller, surrounding towns with some of the same needs but without the money for their own facilities.

Lapriore's report has been referred to the finance committee for further consideration, according to a spokesman at the city manager's office.

State to Cross-Check Welfare Recipients

By Marvin Smallheiser
Special to Computerworld

SACRAMENTO, Calif. – The state Department of Social Welfare has been given the go-ahead by the state Court of Appeals to use a computer to monitor the earnings of 1.5 million persons on welfare.

The court decision is a defeat for the Golden Gate Welfare Rights Organization which sought to block cross-checking of welfare recipient rolls with earnings reported to the state Department of Human Resources.

The rights organization contended that the cross-checking violated welfare recipients' privacy.

The judge ruled, however, that it was only common sense for the state to compare records and it was not an invasion of privacy.

Seek a Rehearing

Jay Eisen, staff attorney for the San Francisco Neighborhood Legal Assistance Foundation, which represented the welfare rights organization, said he planned to seek a rehearing. If unsuccessful, he plans to take the case to the state Supreme Court.

The primary issue, he said, was whether the department could use a computer checkup consistent with existing regulations since policy states the department will rely on information given by the applicant.

The state has no right to invade the privacy of someone's records just to see what they can turn up, he added.

Master List

The Welfare Department will now use a master list of welfare recipients that is on tape and run that tape against tapes in the Department of Human Resources, which gets quarterly reports from employers for unemployment insurance purposes.

The program will also pull out the names of welfare recipients whose earnings were among the top 10% of all welfare recipients so they can be investigated at a county level.

In the last quarter of 1971, before the rights organization obtained a court injunction, it was found that 92,000 welfare recipients earned $74 million and the upper 10% earned $22.3 million, or an average of $675 a month.

Did IRS Get Its Penny Worth?

Special to Computerworld

OGDEN, Utah – The Internal Revenue Service computer center here lost more than it got when computer and clerical errors produced a bill for one penny.

After Charles F. Kinney and his late wife Anita of Alhambra, Calif., found they made an error in their tax return, they paid an additional $34.61. The computer here recalculated their taxes, determined they still owed one cent and produced a bill for it.

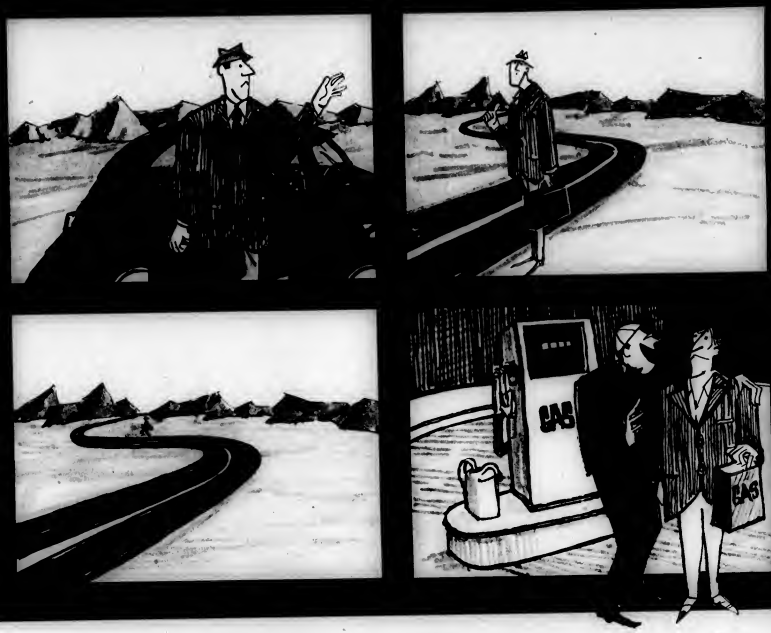
The bills are sent out manually but no one caught the error.

Normally the IRS drops any amount owed below $1. If the Kinneys had chosen to round off their figures, the dunning probably would not have occured.

The IRS did not estimate the cost of the one cent dunning, but it must have lost money on the transaction, taking into consideration computer time, operator pay, material cost and mailing cost.

A spokesman for the IRS said no effort was made to trace the source of the one cent error because the amount was too small.

The Kinneys paid eight cents to mail the penny cash and got a "fancy, two-color receipt" for the one penny.

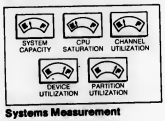


Would you drive a car without a fuel gauge?

Probably not.

And yet no computer built today can tell the user when he's running out of gas. Not, that is, short of the ingenious device of suddenly disappearing systems response.

Somehow, we don't think much of that idea. We believe computer users should know exactly how *effectively* (or ineffectively) their systems are being used . . . where the *throughput bottlenecks are* . . . where the *performance inefficiencies* lie.



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B30

Editorial

Honest Programmers

One of the first user reactions to IBM's virtual memory announcement has been a negative one. Users fear that programmers, no longer constrained by the size of main memory, will begin writing unnecessarily long and sloppy programs.

We think such worries unfairly tar all programmers. In defense of programmers, we turn to Dr. A.P. Ershov's now-famous speech at the Spring Joint Computer Conference:

"In using a machine, an honest programmer displays one more peculiarity. He relates to it as a good jockey relates to his horse. Knowing fully the possibilities which the machine affords, he will nevertheless not allow himself to indulge in a personal intellectual laziness implying reckless expenditures of computational resources.

"This essentially aesthetic relationship of the programmer to his work constitutes a most effective safeguard against the mindless accumulation of software inefficiencies which, though it might not raise any special objections on the part of companies which sell machine time, would cheat the consumer and lose us the full power of machines."

In the face of managements that want everything yesterday and other compromising forces, we think most programmers strive to be "honest" programmers.

The Same Logic?

Letters to the Editor

Quality, Diversification Assures Tape House Success

I must agree with Edward Burt to a certain extent on several points ["Tape User-Industry Pact Needed," CW, Aug. 16]. There is no doubt a price war exists, ultimately placing the results, whatever they may be, in the laps of the users.

Some computer tape manufacturers will go bankrupt or follow RCA and discontinue the tape line. Others may attempt to cut corners, thus eroding tape quality in order to compete in the marketplace.

Burt writes of the extinction of the independent tape service groups due to competition with new tape prices and in-house cleaners and evaluators. On this point our views differ.

Although I agree that many rehabilitation service groups have sprung up and failed over the past years, their downfall cannot be attributed to new tape competition.

For one reason or another these houses were unable to offer the user quality work, reliable service and diversification in programming the user's needs.

For the service company, with a marketing approach designed for the user of the 70's, who is trapped in this price war, extinction is far from sight.

The users of today are looking for quality houses with reliable service and an added feature, diversified programs. For the company which can diversify its controlled library maintenance service into many distinct programs from which the user can choose, a bright future exists.

Through a wide range of programs, a quality house can offer to each installation the program and service best suited to its needs and budget.

Included in these programs should be the sale of such peripheral equipment as cleaners and evaluators. Through experience, I can reliably state that the sale and use of such equipment only enhances the needs for a quality tape service organization.

As for the small libraries, those who can attain the services of a diversified quality house can be assured of the optimum usage of their tape or disk at minimal cost.

One of the basic tasks of DP management is to find and control the installation's weak links. There is a common belief that tape is a non-critical component of the system, and therefore may be taken for granted.

Tape cannot be considered a non-critical element when one considers its exposure to the processes and controls surrounding the usage of tape.

The key to the success of any controlled maintenance program is diversification and *quality control.* A reputable house becomes the maintenance and control factor in a computer library and increases the data-return reliability of that library. Quality control means that effective financial controls are possible.

As Burt states, "tape cannot be purchased like rubber bands and pencils by a buyer." A quality tape service company can become the eyes and ears of the user and the checkpoint between the user and the manufacturer.

David J. Tearpock
King of Prussia, Pa.

Tape Users Have Obligation To Buy on Rational Basis

To most of what Burt says I can only say "amen." Tape certainly must be bought by someone with an understanding of the total picture who can relate the cost of lost computer time to the "bargain" tape.

And it is ironic that just at a time when tape drives are demanding more of tape that a price war favors those who cut corners on quality.

Logic demands, however, that I take exception with Burt's contention that a tape dealer can't be as helpful as a factory man.

The factory employee owes his loyalty to the factory and the dealer owes his loyalty to his customer. The dealer can be more objective in his recommendations to his customer; indeed, he must be because he stands to lose all his other lines of business with that dissatisfied customer just from incorrect tape recommendations.

As there are good factory salesmen with good manufacturers, there are also lackadaisical tape manufacturers and salesmen. We can only pray that this cursed war does away with only the poorest manufacturers and dealers, too.

In the meantime, tape users can help as Burt indicates by buying tape on an educated, rational basis rather than on initial price alone. Most of us have learned about "penny-wise and pound foolish."

Robert E. Lee Rader
President
Data Devices Supply
Orlando, Fla.

Did IBM Win Again?

Did the user really win a bout from IBM ["Users the Winners," Editorial, CW, Aug. 9]? Will the availability of larger, though slower, memory for program storage make computer systems more cost-effective? Has the absence of almost unlimited program storage memory imposed substantial design constraints?

The price of an EDP system includes the development costs, the operating costs and the maintenance cost. The use of virtual memory in most business applications will tend to aggravate operating costs without a concomitant reduction in development cost.

Instead of reducing cost in any category, it is my contention that the availability of unlimited program storage memory will tend to drive up development, operating and maintenance costs by encouraging even more haphazard systems design than we are currently experiencing.

Programs will gravitate toward the more elaborate and complex as they become larger and more unwieldy.

Has the availability of program storage memory materially reduced our ability to produce cost-beneficial systems in the past? Will its almost unlimited availability improve that ability in the future?

Or did IBM win again?

Albert C. Patterson
New York, N.Y.

The user now has more options. Whether he uses them wisely is another question. Ed.

ACS Has Three Questions

The response to the Jan. 12 and 26 letters in *Computerworld* about the Amateur Computer Society was nearly overwhelming, and took several months to clear up. Over 100 readers inquired about the ACS, and over 70 became members. Letters are still coming in now and then.

Would CW readers have answers to these questions?

- Is there someone willing to sell (or otherwise dispose of) his copies of the first (1955) and second (1957) computer surveys in the BRL series by Martin H. Weik (which, unfortunately, was discontinued after the fourth survey)?
- Does anybody know of a program, preferably in Fortran IV, whose input is sextant and celestial data; output is latitude and longitude, or at least an intersecting pair of lines of position?
- Is there a comprehensive bibliography of books on Basic?

Stephen B. Gray
Amateur Computer Society
Darien, Conn.

New Problem for Managers

The IBM announcement raises a problem for data processing management it did not have before; i.e., how are managers to evaluate the efficiency of a program in a paging environment?

It seems that the paging supervisor should give some kind of statistics that would be helpful. One statistic would be the size of the working set relative to the total size of a program.

Since such statistics vary with the machine load, it may be necessary to relate paging characteristics to some "standard" load.

Paul Teicholz
South San Francisco, Calif.

In Defense of Blue Cross

Re: The Taylor Report, July 19.

I must agree with Alan Taylor that BC/BS (Blue Cross/Blue Shield) could have responded to his inquiry in a little more intelligible and complete manner, but that is all I can agree with.

Taylor is always, it appears to me, knocking someone or something. Two cases in point are the BC/BS statements and the school grade cards.

In both cases, the abbreviation of names brings cries of disdain to Taylor's lips as though a student's teachers weren't known to his or her parents. The use of repetitious comments also appears to alarm Taylor.

Is it not possible that more than one teacher can make the same observation, especially since there appears to be a list of comments accessed by punching one or more numeric digits into a comments field in the input field?

To cut this subject short, more could be said, and go on to the BC/BS report, if Taylor doesn't know who Framingham ORT is, then he is in a "heap of trouble, Boy." I do not see any indications that claim # 0811764 does not belong to Taylor.

If note is made of the type of service in the approved claim form, it will be seen that this is for "Diagnostic X-ray" and that the unapproved claim, while of the same claims form number, is for "Medical Service," assuming the key is the same for the two forms. This is not a contradictory situation, but two separate transactions.

One final point – at installations like BC/BS where millions of forms are printed each year, the time involved to do a table search and data move for each entry like "PLAN" and "TYPE OF SERVICE" would amount to a sizable sum over a year's time. Also, when payment is made by check, this is a valid receipt recognized by the IRS for tax purposes.

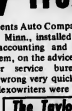
David G. Nagel
Wabash, Ind.

The End of the $485,000 Clements Case

They Trusted Service Bureau—And Lost $100,000

When Clements Auto Company in Mankato, Minn., installed an automated accounting and inventory system, on the advice of a computer service bureau, things went wrong very quickly. The eight Flexowriters were unable to keep with the input – because there were many more parts than the estimated 45,000. There were more customers, too, than either Clements or the service bureau realized (the service bureau had studied the problem for only two weeks).

The Taylor Report
By
Alan Taylor, CDP



Soon the billing fell far behind. The operators' production rates, estimated at 110 line item/hr, were under 60. The low temperatures of the state's winter caused downtime – and the inputs had to be taken to a central area that could be kept warm. The packing slips, which were expected to be produced with the invoices and shipped with the goods, were never produced – and so a control document was lost.

Updating Missed

Updating of prices had been expected to be handled in the lulls between activities. But there were no lulls! Even though two extra Flexowriters were added, the operators never seemed to get ahead. They did not have time for updating – and the auto parts were sold at under true costs. (The management reports, however, showed unrealistic "profits.")

Nor were the problems simply with the input. The reports of inventory and movement were maintained on two separate files – which were not compared. (The second file was kept apparently to avoid processing the cost master file completely during each report period.) Soon the staff using the printouts became suspicious of their accuracy. Items appeared to have different stocks than they should have. Item numbers unknown appeared on the listings. Soon the men were walking into the stock room to check on the physical stock.

The Customer Was Patient

The customer was patient. The monthly reports – on a management-by-exception system – were more than two-feet-high. Many items in the system had never been stocked by Clements – and the zero balances were confused with out-of-stock, but stocked items. Yet the customer waited and let the service bureau try again. He was patient.

When the matter came before the court of appeals recently, the judge broke the case down:

"The Mankato outlet began implementing the system in September 1963, but the entire company was not converted until April 1964. The first reports, which were received throughout 1964, showed only a six-week movement history and contained no on-hand figures.

"While these factors caused some problems in utilizing the reports, Clements knew that they had contracted for exactly that type of report. However, it also became apparent to Clements that the sales reports were extremely bulky and error-prone, making them even more difficult to use.

"The record indicates that Clements and the service bureau, which was IBM's subsidiary, Service Bureau Corp., were both aware of the problems involved and worked together to try to get some of the mechanical difficulties out of the system. Despite their efforts, the problems continued.

"[Clements] had difficulty getting its buyers to use the reports. In the latter part of 1964, the movement history was lengthened from six to twelve weeks to obtain more reliable data. Shortly thereafter, the parties entered into an agreement which provided for the second-generation inventory reports.

"These reports incorporated a large number of on-hand figures and also accounted for inventory purchases, receipts and interbranch transfers. These reports were to begin in January of 1965.

"At this point, we believe there is still support in the record for a finding that Clements' actions resulted from SBC's representations. Even though the problems were viable, the system was new to Clements and its employees.

"With some progress having been made in obtaining reliable input, and with the prospect of a longer history and more sophisticated reports, Clements may well have been justified in continuing the program. (See, e.g., Davis v. Re-Trac Manufacturing Corp.)

"However, when the second-generation reports were received, beginning in January 1965, Clements clearly became aware of the debilitating nature of the problems in the system. The reports were still error-prone and difficult to use.

"Since the history was for a twelve-week period, we find that Clements was justified in continuing with the system through March 31, 1965. At that point, reliance was no longer justified, and Clements had the choice of terminating the contracts pursuant to the notice provisions or of assuming reponsibility for further damages.

"Since the contract provided for 30 days' notice before cancellation, we find the cutoff date to be April 30, 1965."

And he disallowed all losses that Clements had incurred since then. The trust that it had given to SBC cost it over $100,000 in those lost damages.

"It appears as though the user's responsibility is to complain and stop trusting data processors if they continually let him down!"

It appears as though the user's responsibility is to complain and to stop trusting data processors if they continually let him down!

(Of course, how one acts when the computer is in-house I do not really know.)

This idea of user responsibilities is important. This is the first time I can recall anything said about it. When the case first appeared, much was made of the size of the award to Clements, and the fact that IBM was involved.

Stockholders asked Thomas J. Watson Jr., then IBM chairman, about its importance. After several days, he said the company was appealing, and that there only were a few cases anyway. Now the appeal is over.

It may still not be important to IBM, but it certainly is important to users of service bureaus.

It certainly is important to the DP professional – for it is the beginning of defining the duties the professional owes his clients – and the duties that the client, or user, owes to him.

And that's an important thing to begin – even at this late date!

The Service Bureau Lost More

IBM's appeal in the Clements case resulted in damages being cut from the original $485,000 to about $300,000. Still, that was a substantial amount. The defense team, headed by General Counsel Nicholas Katzenbach, made quite a number of defenses, all of which were struck down by the judge.

One of IBM's defenses was that the result of the case allowed the law to be interpreted differently under the contract and tort. This did not seem right to IBM, that the result could depend upon the "label." It accordingly asked the judge to remove any liability.

The judge refused, pointing out that for the IBM case to succeed, there would have to be a valid warranty which negated even innocent warranties in the contract.

He said this did not appear allowable under Minnesota law, and quoted an earlier case which said: "The law should not, and does not, permit a covenant of immunity to be drawn that will protect a person against his own fraud. Such is not enforceable because of public policy."

The court also quoted earlier cases to show that the SBC's representative need not know the falsity of representation he makes before fraud can be found. In the earlier case, a manufacturer's representative had gone to the purchaser's construction site, and observed operations there.

He had then stated the equipment he was offering "would keep up with and surpass any other machine then being used by the (purchaser) and that it would work in cooperation with (the) other machines and equipment."

Vital to Operations

This had been found to constitute a fraud. The court in that case said: "This was more than mere sales or trade talk. It was vital to defendant's operations that their machinery should work in harmony and that one piece should not impair the effectiveness of another.

"Plaintiff possessed the knowledge of the machine and its capabilities, and its (plaintiff's) false assertion . . . that the (machine) would do a certain amount of work and coordinate with the machines already owned by defendants was an assertion of fact and constituted fraud."

Based on these precedents – IBM's bureaus still appear to have quite a lot of responsibility left, even though the user has now been put on notice that he also has responsibilities.

Letters to the Editor

'Codasyl Keeping Users Informed'

The Aug. 16 issue contained an article on the Association of Computer Programmers and Analysts (Acpa) and its criticism of Codasyl's action on the Cobol Report Writer feature.

It is sad and disheartening to read of a professional group such as Acpa that has responded to uninformed rhetoric and has endorsed the distorted view espoused by others.

Acpa has accused Codasyl of "apparent lack of interest" in soliciting user opinion. The fact is that the Codasyl Programming Languages Committee, the committee in question, has a user membership equal to 63% of the committee.

Its user members include U.S. Steel Corp., the National Bureau of Standards, American Telephone and Telegraph, the Canadian Federal Government, Xerox and the U.S. Air Force (the largest user of computers in the world).

In addition, the Codasyl Planning Committee exists for the sole purpose of informing the user community of Codasyl activity and soliciting user response. Guide International, representing more than 1,000 IBM computer users, is a member of the Planning Committee.

To accuse Codasyl of "questionable motives" in ignoring users is analagous to accusing a drowning man of ignoring the ocean into which he is sinking.

It is also interesting to note the irate reaction from many users that resulted from the news that Codasyl was even considering deleting the Report Writer feature.

Like several hundred proposals received by Codasyi each year, I'm sure this one will be given due consideration. I wonder if the public would feel more secure if Codasyl arbitrarily refused to consider some of the suggestions it received from users?

M.L. O'Connell
Hacienda Heights, Calif.

Compatibility... In Whose Eyes?

David Ferguson's comment in the Aug. 2 issue that System/3 is not compatible with System/370 or the Burroughs B1700 misses the point as to what compatibility really is.

Two systems should be considered compatible if two virtually identical source programs run on each of the machines producing identical results with performance acceptable to the user.

The key terms in the above statement are "virtually identical," which would permit a certain amount of manual modification to the original program (to change device names, for example); "identical results," an obvious requirement; and "acceptable performances," a subjective decision by the user who might find degraded performance quite acceptable.

The fact that S/3 uses zoned arithmetic instead of packed arithmetic and that the Burroughs instruction set does not faintly resemble S/3 should not be considered in the compatibility question as Ferguson concludes.

If the desired result is accomplished by 500 accurate machine mechanisms banging away at abacuses producing identical results with acceptable performance, then it must be stated that this system is compatible with S/3.

Ferguson's claim that limiting an S/3 user to RPG II means severe limitations goes against the general trend of the industry which is striving for greater programmer automation through the use of higher-level languages, efficient compilers and very fast computers.

We run a shop with close to 400 programs, all but two written in RPG, nearly all running at I/O speeds and compatible (by my definition) with S/3, System/360, System/370, Univac 9000 and now Burroughs 1700.

If we had written them in assembly language, as Ferguson suggested, we would have had no increase in performance with loss of compatibility.

Gary Mokotoff
President
Data Usage Corp.
Fort Lee, N.J.

Since there doesn't seem to be any standard DP definition of "compatibility," it's not surprising that you and Ferguson fail to agree. However, users who have been badly burned in trying to convert from one system to another probably will agree more with Ferguson's "all or nothing" definition. Ed.

Questionnaire on Dumping Cobol Report Writer

1. Has the Cobol Report Writer been ineffective?	Yes	No
2. Has the Cobol Report Writer made compilers too large?	Yes	No
3. Would you object if the Cobol Report Writer were placed in a separate, but integrated, piece of software separate from the main compiler?	Yes	No
4. Should language feature maintenance depend upon PLC's definition of Cobol, or the potentially quite different current Ansi standard?	PLC	Ansi Standard
5. Should PLC keep proposals to change Cobol secret?	Yes	No
6. Do you think the Report Writer should be dumped?	Yes	No

Name_____

Organization_____

Position_____

Address _____

_____

Memberships _____

Cobol Support Fund Contributor. YES/NO $____ enclosed.

When completed, please return to SCDP Cobol Coordinating Committee c/o Professional Viewpoint Page, Computerworld, 797 Washington St., Newton, Mass., 02160.

The Professional's Viewpoint

Why USAF Wants Writer Out

By Oscar Watts
Special to Computerworld

Proposals to change the Cobol language are not public, and are kept confidential by the Programming Languages Committee (PLC) of the Conference on Data Systems Languages (Codasyl).

One such proposal – that of deleting the entire Report Writer area from the Cobol specification – is currently under priority consideration by the committee. The U. S. Air Force, which had made this proposal, has provided the Society of Certified Data Processors Cobol Coordination Committee with a copy of it, although PLC refuses to do so.

This Professional Viewpoint Page was produced by the Society of Certified Data Processors, in conjunction with the editors of Computerworld. Societies interested in the preparation of this page should contact the editor of Computerworld.

Ineffective Compiler Size

In its proposal the USAF argues that:

- Including the Report Writer makes the Cobol compiler too big.
- The Cobol report writers have not been effective. (Effectiveness is described as easy to understand and easy to use.)

William Rinehuls, the USAF PLC representative, told the SCDP last week that his proposal would leave the new Cobol standard untouched, including the new Report Writer specification.

It would, however, free Codasyl from having any function with regard to the clarification of ambiguities in the language.

Many Ambiguities

Rinehuls said that all languages had ambiguities, and that the Report Writer had many, as it was a very complex specification.

The current Report Writer position is, therefore, that:

- There is a standard Cobol Report Writer on the books.
- There is a new proposed standard Cobol Report Writer in Ansi X3 Committee's hands, awaiting a decision on how it and the rest of the proposed new Cobol standard can be distributed at a reasonable cost. (Suggestions as to how to do this include sending it out on microfiche!)
- There is also a proposal to drop Report Writer out of the Cobol specification, which would effectively result in the new standard being at best a temporary solution, and more likely stillborn.

Secretarial Task Heavy

An alternative unofficial suggestion as to why the USAF may validly want Report Writer out of the language has been suggested to the SCDP by knowledgeable sources. This suggestion is related to the USAF's position as secretariat of the Programming Language Committee – and so having the responsibility of maintaining the official Cobol language definition.

This maintenance is handled by keeping a large book, and with pen or scissors and paste altering it, after each meeting, with the many changes that occur.

The removal of the Report Writer sections would certainly make this maintenance job – and therefore the job of the PLC secretary – a lot simpler. Since the job is generally accepted as onerous and almost impossible, the removal of the Report Writer could be the only way to keep it working smoothly.

No Substantiation

The SCDP Cobol Coordination Committee notes there is no substantiation of the ineffectiveness of either of the Report Writers in the USAF proposal, nor is any reason advanced as to why the facility cannot be put into a separate software item, and interfaced with a Cobol compiler rather than be created as a single entity.

The committee is also disturbed that the maintenance position of the current and potential new report writers is not brought out, thus leaving the user community unaware of the actual potential that can be in force immediately after a PLC vote.

Under these circumstances, the committee has asked the PLC to table the proposal until there is time to consider it properly. The readers can help in this consideration by writing to the SCDP Cobol Coordination Committee giving their views, or by filling in the attached questionnaire.

Oscar Watts, CDP, CPA, is executive vice-president of Automated Information, Inc., St. Louis. He serves as chairman of the SCDP Cobol Coordination Committee.

Firm Meets Crane Safety Ordinance While Enlarging Engineering Areas

By Howard I. Shapiro
Special to Computerworld

NEW YORK – Our firm, composed of three engineers and three draftsmen/technicians, never seriously considered using a computer, until late in 1969 when New York City adopted an ordinance requiring documentary proof that a crane or derrick can handle its rated load in any given capacity.

We estimated that, using conventional manual methods, one crane analysis alone could require up to four months' work.

It was not long after that we ordered the IBM 3/6. It was installed in February, only about four months after it was announced.

Crane analysis requires complex programming, and was one of the applications that led to the installation.

Just as the user responds to system requests for information at different points in some programs, the computer identifies syntax errors as they occur during keyboard entry of instructions. A small arrow points to the error or omission of essential data. This feature is a real timesaver.

To verify the manufacturer's ratings on a crane or derrick, we obtain the appropriate drawings and literature, extract the information we need, and create a data file on the disk pack.

The data file is a mathematical description of a particular unit, such as the P&H Model 6250 TC – the 250-ton truck crane. The data file includes a complete physical description, in numerical form, of the boom and its members, all conditions of operation, the manufacturer's rated load for every operating condition and accessory equipment used in boom operation.

Also included are program switches that activate various subroutines in the program which performs the analysis. The program is on the same disk pack, identified by name.

All data is entered at the computer's console, which includes a teletypewriter and a 10-key "adding machine" section for entering numbers.

All data entered is triple-checked. When we are satisfied that everything is ready, we perform a production or "money" run, dated and numbered under strict controls so that the printed output – headed by the date and run number – is clearly identified as pertaining to a specific set of analysis conditions.

Series of Charts

The output is essentially a series of charts, one for each boom length. For each operating radius it provides the safe lifting load, which is basically what we're after. We also get a range of additional operating data, including a code which reflects the critical loading case (for example, the impact on rated loads due to sudden stops), and the point in the equipment structure which is critical in determining safe capacity.

To produce one chart for a 200-ft-long boom requires the repetition of program segments made up of about 40,000 statements. Some statements are algebraic expressions a paragraph in length.

The final column in each chart is, in effect, a summation: a zero-zero reading means that all ordinance requirements have been satisfied at the manufacturer's rated load. Any other reading tells us exactly where the problem lies and which of six loading cases is critical.

New York City authorities have accepted the programs on which these analyses are based, and therefore the results of each analysis.

The primary purpose of the computer was to permit us to perform these analyses quickly and economically, and to provide the in-house capability to build on existing programs. Yet, almost immediately, we found other uses.

The day after the computer was installed, we needed a set of values to help design a sprinkler system, normally a four-hour job. Within 20 minutes I wrote a small program that produced the values, and have since reused it on several occasions.

A portion of our activities is also spent in designing derricks. The firm recently designed a unit which can safely handle a 35-ton load and yet can be built of relatively light materials, can be erected very quickly and can be used economically for smaller loads.

There are now eight programs on a single disk pack, and the same pack is used for data files and "work areas."

Engineering work requires constant program writing and debugging, and any tool which eases the requirement lowers costs and obviates the need for a separate programmer/operator. This is especially vital to a firm our size.

The Model 5213 printer has a carriage speed of 85 char./sec, as opposed to 10 char./sec on a previous service terminal. The system's direct access auxiliary storage unit can file 2.45-million letters and numbers, which comprise the data base.

Shapiro is with the firm of Charles M. Shapiro and Sons, Brooklyn, N.Y.

Pollution Deadline Being Fought

FAYETTEVILLE, Ark. – Researchers here are trying to keep the new, booming recreational area at Beaver Reservoir in northwest Arkansas from becoming another Lake Erie.

A $172,000 study financed by the Northwest Arkansas Regional Planning Commission is now in its second year as University of Arkansas researchers gather current data on industrial, municipal and private water pollution practices and controls.

"The Upper White River Basin drains into Beaver Reservoir," said Kenneth Riley, executive director of the commission. "If pollution from industry, towns and cities and individual residences is allowed to enter the reservoir in an uncontrolled manner, its recreational and ecological value will disappear.

Need to Predict

"We're trying to develop a systematic means of predicting pollution levels and sources so that appropriate control measures can be taken in the most effective and economical ways. If we know treatment plants are needed, we can plan for them now and begin building them before conditions become hazardous."

Storing in-depth data in the university's IBM 360/50 for processing is the major effort now.

Survey teams have been sampling well, spring, creek and river water, plant and municipal effluent and the condition of the reservoir itself, since May. Their studies will be completed next year.

Patients Find Computer Ready To Hear Problems

BIRMINGHAM, Ala. — A common saying among programmers is that the measure of a computer's sophistication is whether it can be distinguished in "conversation" from a human being. It now appears that computers can be good listeners.

Dr. Warner Slack, physician and assistant professor of medicine at Harvard Medical School, and his brother, Dr. Charles Slack, a psychologist and consultant at the University of Alabama collaborated last year in an experiment at Beth Israel Hospital in Boston to test the willingness of people to talk to a computer, and to see whether verbalizing of problems would be helpful.

The Beth Israel experiment involved a PDP-12, a display terminal and a tape recorder. The computer was activated by the voice of the subject.

Subjects were first given a psychological interview and then encouraged to talk to the computer about their problems.

The 32 subjects were volunteers from Boston area colleges.

The first session was for orientation.

The volunteer faced the computer and talked at will. Information received from the initial interview at the beginning of the computer session was used to stimulate and encourage further talking later on.

The results showed that subjects preferred to talk to the doctors rather than the computer, but that eight of the 32 subjects felt it was easier to talk to the computer; these felt less inhibited. Four subjects stated they were actually helped by the experiment, according to the doctors.

Aussies Getting Crime Analysis

SYDNEY, Australia — Courts throughout New South Wales are supplying basic information for Australia's first comprehensive computerized statistical study of crime.

The state's justice minister said courts of petty sessions were returning information which would result in detailed statistical breakdowns of more than 10,000 cases for many types of offenses.

The program began this year through the Bureau of Crime Statistics and Research.

Random Notes

Datacraft Macro Assembler Allows Local Symbol Usage

FORT LAUDERDALE, Fla. – The software supplied with Datacraft Series 6000 minis has been expanded to include a two-pass Macro assembler system that provides a one-for-one map into machine language instructions and single- or multiple-data word configurations.

The assembler is supported by all current Datacraft operating systems. Its macro capabilities include the ability to define local symbols as well as its own operation codes. It can also nest 50 macro levels and execute recursive macro calls. The company is at P.O. Box 23550, 33307.

Insurance Agency Accounting Package Runs in 32K Bytes

CAMBRIDGE, Mass. – Insurance agencies with access to a 32K-byte CPU with four tapes or disk spindles can perform basic accounting functions tailored to their needs, with the Computerized Agency Processing System (Caps) from Data Operations Inc.

Caps handles accounts payable, current and receivable; customer, producer and broker statements; and ledger cards, as well as expiration lists and statistical reports. A separate module generates profit and loss statements and other financial reports.

Basic Caps, written in Cobol, costs $6,000. With the P&L module, the package costs $8,000, the company said from 2464 Massachusetts Ave., 02140.

Both Xerox and Boole & Babbage Open New Facilities in Dallas

DALLAS – A Southern Technology Center was opened here recently by Xerox Corp. to support the company's computer customers and operations in the South and Southwest. The new office, is in the Bank of Dallas Bldg., 3635 Lemmon Ave.

Meanwhile, Boole & Babbage Inc. has opened a district office in 400 Tower South, 2720 Stemmons Freeway, to serve the south central states.

HIS Builds Conversion Library

WELLESLEY, Mass. – Honeywell's Conversion Technology Center currently has a library of 115 packages as support for the company's marketing force, according to center manager, Mal Smith.

The packages have been developed by botb Honeywell and outside software houses, he added, and the library will be expanded as needs grow. Thirty of the programs are for Honeywell-to-Honeywell conversions and the rest are designed to ease the change from competitive systems to Honeywell.

Turing Award Winner

Dijkstra Sees Programming Revolution

By Don Leavitt
Of the CW Staff

BOSTON – Programmers will do a better job if they "approach the task with a full appreciation of its tremendous difficulty . . . stick to modest and elegant programming languages, and respect the intrinsic limitations of the human brain," Edsger W. Dijkstra told ACM '72 as he accepted the A.M. Turing Award earlier this month.

Dijkstra, one of the developers of the Algol language, is now at the Technological University in Eindoven, The Netherlands. The Turing Award is the highest one given by the Association for Computing Machinery (ACM).

Bug-Free Systems?

A "revolution" is coming and well before 1980, Dijkstra said, programmers will be able to design and implement systems that are straining current abilities. This will be done at a fraction of the cost, in time and money, used on major systems today, and the results will be "virtually free of bugs," he said.

Three conditions must be met for the revolution to take place, he added. The world at large must see the need for the change; the economic need for it must be sufficiently strong; and the change must be technically feasible.

Dijkstra said he expected "no disagreement anymore" on the need for more reliable software. And management, accustomed to software costs matching hardware's, will push hard to cut programming costs as mainframe vendors drop their prices in the coming years.

The change is possible, he noted, if DP staffs confine themselves to "intellectually manageable programs." Several rules have been discovered, violation of which will impair or destroy the intellectual manageability of a program, he said.

Some of these rules can be imposed mechanically, by requiring a suitably chosen language, and providing standards for its use. The other rules are matters of "discipline," he said.

There are six arguments in Dijkstra's view, to support the idea that better programming is technically feasible. First, the programmer who is only considering intellectually manageable programs has much easier alternatives to cope with. Second, if he reduces his concern to a subset of manageable programs, he achieves a further drastic reduction of the "solution space."

In the third case, the programmer should build, before he writes any code, a convincing proof of the correctness of the program he wants to create. He then writes his code, always checking against the restraints of the proof of correctness.

Deapite current thinking, Dijkstra added, the intellectual effort required to design a program need not grow as the square of its length. Investigations have shown, he said, that by suitable application of the powers of abstraction, the effort need be no more than proportional to its lengtb.

Tomorrow's languages, hopefully, in the way they are coded, will invite programmers to include the abstractions needed to cope with the complexity of the problem at hand, he said as his fifth argument. He called for recognition that the "only problems we can really solve" are those that finally admit to a nicely factored solution. Wider applicability of those nicely factored solutions, Dijkstra said, is the sixth point in his reasoning that a revolution in programming might take place in this decade.

'Ipam' Manages Data Swapping Between or Within OS Regions

ROCKVILLE, Md. – OS/360 users can build work files for a single program or pass data from one executing program to another between or within regions or partitions, with the Inter-Partition Access Method (Ipam) software from Comress Inc.

Functionally, Ipam allows the use of first-in/first-out (Fifo) queuing and communications capabilities. An Ipam output queue from one partition may, for example, become input to another partition whicb in turn may generate another Ipam output for input to the first partition, Comress said.

Within a single partition, an Ipam queue may be used as both output and input to produce a Fifo queue. Ipam queues may also be used, a company source noted, as store-and-forward operations between different programs running at different times.

Still another usage of Ipam capabilities allows programs from several regions to place output into a single queue which becomes input for another region. The reverse situation, with one program creating an output queue that becomes input to several others, is also possible, the spokesman added.

Similar in program logic to IBM's Basic Sequential Access Method (Bsam), Ipam is faster, Comress said, because each Ipam queue is at least partially core resident.

User control over the number of buffers allows adjustment for either minimum core or maximum transfer speed as may be required, application-by-application.

Although they may serve the same function as conventional tape-based work files, Ipam Fifo queues, residing as they do in core or on disk, do not require closing, rewinding and reopening between their use as output and input.

The ability to pass data between a program on one side of an Ipam queue and several others on the other side is considered by Comress to be particularly suitable for teleprocessing operations with several terminals.

The Ipam package, with the programs on a 7-in. magnetic tape mini-reel, is currently being distributed by Comress, from 2 Research Ct., for $3,800 under a three-year lease plan.

'Composit' Handles MIS Chores

ANN ARBOR, Micb. – Corporate managers, from the president's office down, can query files for specific data, or generate a wide range of fully formatted financial and personnel reports, with the Composit '77 service now available on the Com-Share Inc. time-sharing network.

Composit '77 has many of the features of the management information systems many companies tried to implement during the late 1960s. The difference is that this service lets the user build his MIS one step at a time, a network spokesman said.

The files can be tailored specifically for each user and typically might provide on-going information on all programs, as well as data needed for standard comparative analysis and operational reporting functions. Users need have no DP experience to inquire against the file or to create a report, Com-Share noted.

The system allows the generation of reports on revenue performance, budget variances, plant production and cash flow vs. plan appropriate for highest-level management.

The director of corporate planning, on the other hand, might benefit more from analyses of national product data, marketplace trends or industry performance comparisons, a Com-Share source suggested.

Under the same service, the controller of a company can do budgeting and monthly reconciliation work, asset management and cash planning. Personnel can massage an employee's skills inventory, or generate a payroll analysis or do an inventory of active resumes.

Com-Share Inc. is at 2395 Huron Pkwy., 48106. Its network can be reached by local calls to 14 cities nationwide.

The new 3200 fci tape from BASF.

Any tape error can cost you recycling time and dollars.

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There's one thing we *don't* do to our latest tape. We don't sacrifice any of the push for perfection that has always characterized our previous tapes. BASF/2000 A.D., in other words, is quality added on—not a trade-off.

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COMMUNICATIONS

Data Briefs

Control System Configured For Specific Applications

IRVINE, Calif. – Telefile Computer Products Inc. has a Communication Control System, the TCP-64, that is described as a grouping of major components configured for specific user applications.

The system includes a Lockheed MAC minicomputer, a 360/370 CPU interface, disk controller and a line controller that can handle up to 16 lines. The CP-16 MAC mini includes 8K of core and is expandable to 65K words. It includes interrupt capability, automatic bootstrap loading, data buffer storage, code conversion and other communications features.

A typical TCP-64 system costs about $1,210/mo without line adapters. The adapters are available in two-line units for $14 to $100 depending on the user's configuration. Telefile is at 17785 Sky Park Circle, 92664.

Modem Features Reverse Channel

NEWTON, Mass. – Codex Corp. has a 4,800 bit/sec dial-up modem with a reverse channel for full-duplex asymmetrical operation.

The half-duplex 4800 dial model has a 40-msec turnaround time, which includes speeds above 3,600 bit/sec, the company said. The modem combines automatic and adaptive equalization with quadrature amplitude modulation.

The half-duplex unit costs $5,975. Other versions cost $3,175 and up, the company said. The modem is available in 60 days from Codex at 15 Riverdale Ave., 02195.

Infrared Light Used in Cable

PHOENIX – An optical cable for data transmission from Quadri Corp., uses infrared light as the transmitting medium.

The Model 2402-01 cable transmits at 5 MHz, up to 50 feet, and costs $41.50. The longer cable, Model 2402-02, transmits up to one MHz, and costs $46.50 The firm is at 2950 W. Fairmount, 85017.

Chicago—N.Y. Service Set

WASHINGTON, D.C. – MCI Communications Corp. will begin offering private line services between Chicago and New York next spring. The new specialized carrier has contracted for the construction of 54 transmission sites along the route.

Current plans call for service to be expanded from Chicago to Cleveland and Toldeo in April 1973.

After that, cities will be added to the MCI network at about one-month intervals as follows: Pittsburgh, Philadelphia, New York, Newark and Detroit. Complete service between Chicago and New York will be available by summer, a spokesman said.

NCR Introduces Two Data Couplers

DAYTON, Ohio – Users of NCR 260 data terminals can now have two 300 bit/sec couplers in addition to Bell data sets. The NCR 260-400 and 260-500 data couplers are priced one third to one quarter below the cost of a Bell data set, according to the firm.

The 260-400 coupler operates as an originate-only coupler while the 260-500 will operate in both originate and automatic-answer modes. In the answer mode it can be used unattended.

Both couplers can connect to telephone lines through an acoustic adapter, or directly through a Bell data access arrangement.

The 260-400 sells for $430 or rents for $15/mo. The 260-500 costs $560 or rents for $20/mo.

Savings up to 48% Possible

Selected Users Hear AT&T DDS Plans

By Ronald A. Frank
Of the CW Staff

NEW YORK – Charges for AT&T's Digital Data System (DDS), scheduled to begin service in 1974, could be 20% to 48% less than current private line rates.

The "illustrative rates" for DDS are being presented to selected high-volume private line users of AT&T as part of a confidential briefing by local operating companies around the country. At the presentation users are being told the rates are tentative and are designed only to assist AT&T in planning the Digital Data System.

The DDS service will begin between Boston and New York in Jaunary 1974, according to the AT&T presentation. Washington, D.C., Philadelphia and Chicago will be added at one-month intervals to provide a five-city network by June 1974. The schedule calls for Los Angeles to San Francisco service in July and in October the West Coast will be connected to the system, probably via Chicago.

Total of 96 Cities

Cities will be added to the network at the rate of three per month during 1974 and by the end of that year AT&T plans call for service to reach 24 cities. The full 96-city digital system is scheduled to be operational by the end of 1976, according to AT&T estimates.

The system will provide full-duplex digital service at synchronous speeds of 2,400, 4,800, 9,600 and 56K bit/sec. AT&T will control the network clocking signals necessary to provide the synchronous service.

Two-point single station service will be available initially to the first cities and two-point multistation service will be available in 1975, according to AT&T.

Speed (bit/sec)	Present 3080 Series Rates	Proposed DDS Rates	Percent Decrease
2,400	$938	$487.30	48%
4,800	$1,118	$747.45	33%
9,600	$1,538	$1,201.90	22%
56K	$6,616	$5,337.50	19%

The chart compares present private line rates with the proposed charges being quoted by AT&T. The comparison was done by a user who installed the pair of modems, as follows: at 2,400 bit/sec a Bell 201 at $75/mo; at 4,800 bps a Bell 203 at $212/mo; at 9,600 bit/sec an independent modem at $378/mo; and at 56K bit/sec a Bell 303G at $485/mo.

Multipoint multistation service will also be available to users in 1975. Present plans call for a digital data switched service to be added between 1978 and 1980, AT&T said.

The proposed rates include a sliding scale ranging from $1/mo/mile for the first 25 miles at 2,400 bit/sec, up to $15/mo/mile for the first 25 miles at 56K bit/sec. Service terminal charges will range from $60/mo at 2,400 bit/sec to $100/mo at 56K bit/sec.

Present AT&T plans call for the Data Service Unit (DSU), which is required to interface a user's terminal to the DDS, to cost $15/mo and each station on a circuit will cost the user a multistation charge of $20/mo.

Analog Extensions

For users who cannot directly connect to the DDS in cities where digital service is available, AT&T will offer analog extensions at standard rates for 3000 series and 5000 series channels, AT&T said.

But an additional analog-to-digital connection charge will be made for these users. The connection charges range from $100/mo at 2,400 bit/sec to $200/mo for the other three data speeds.

Users attending the AT&T briefing are being told the DDS will have a design objective of 99.5% error-free seconds. When problems do occur, AT&T has pledged to isolate a problem in 15 minutes. During this period a problem will be defined as originating in a DSU, a local loop or in other carrier facilities.

And depending on the problem, AT&T said it will take up to a maximum of 90 minutes to restore service to the affected user. Remote loop-back and standardized data speeds within the central office will help to solve any malfunctions, AT&T said.

Asked to comment on the DDS data presented at the briefings, an AT&T spokesman described the material as "company confidential," and said the carrier would have no further statement.

Users, Vendors Irresponsible In Attitude to Right Equipment

By Frank Oliver
Special to Computerworld

Most companies take a very basic view of their data communications operation. The data communications staff is usually given a secondary role compared with the overall data processing operation.

It is unusual to find a data communications staff occupying a position of importance within these companies. This lack of recognition by corporate executives, staff members and DP managers only serves to further bury the importance of data communications. And it quite often results in poor execution of computer/communications systems within otherwise competent companies.

The communications manager or designer is also to blame for spending his time complaining about the quality of common carrier services when he should be planning how to protect the transmission of his data.

The poor quality of common carrier service is such a well-documented fact that a designer who neglects it is being irresponsible.

It should be realized that with their present facilities the common carriers cannot do any better than they are doing. The quality of data transmission can only be improved by the use of more sophisticated and intelligent network components.

The people attempting to provide better network equipment, the so-called third-party or independent vendors, must rely on the users to tell them what products are needed. This is a major source of irritation to the vendors because it has forced them to continually introduce products which do not sell.

The reasons for this are two-fold. In the first place the users for the most part have not represented a competent source of such information. The result is the same old equipment in a different cabinet with a different color light on the panel.

And when a worthwhile piece of new equipment is introduced, the users refuse to put their money where their mouth is. It is no wonder that the data communications area is so chaotic and redundant.

The user can help solve this problem by giving enough thought to his network needs to start asking for the right equipment and by using it when it is made available.

These vendors can help themselves by not introducing the same old thing in a new box. This industry needs another time division multiplexer, or 2,400 bit/sec modem or teletypewriter-compatible terminal like it needs a higher transmission error rate.

On the other hand, the mainframe suppliers, by not producing state-of-the-art teleprocessing equipment, betray the confidence and trust placed in them by that segment of their customers which would not dare shop elsewhere. This lack of responsibility is exceeded only by the DP managers who put up with it.

This data communications attitude and general lack of concern associated with solving network problems have shown themselves most strongly in the absence of a communications support industry. This is a gold-mine which is virtually non-existent because the user community has not demanded its creation.

There are no schools, similar to the computer schools, turning out data communications technicians. There are no formalized courses of education for either on-site or off-site instruction in network design, network administration or network operation and maintenance.

There are no companies purchasing equipment from multiple vendors and putting it together under a single company name for customers.

There are few facilities management companies. There exists no company producing a complete line of data communications accessories. These companies do not exist because the users have not shown enough concern to demand them.

Oliver is a member of the Hughes Aircraft Co. technical staff specializing in teleprocessing.

Viewpoint

Ascii Capability, APL Character Set Added to Terminals

BEAVERTON, Ore. – Tektronix Inc. has added full Ascii capability and the APL character set to its graphic terminals.

The full upper- and lower-case Ascii capability is offered in the 4012 display terminal. The Ascii set plus the APL capability is included in the 4013 display unit.

Both of the expanded models are designed as upgrades for the earlier 4010 display which was limited to upper-case characters. The terminals use the storage tube method to display data on the screen.

With this type of terminal the phosphor coating on the screen acts as the memory medium and refresh electronics can be eliminated, a spokesman said. Once the data is displayed on the face of the storage tube, the data remains until it is erased, he added.

The Tektronix displays are designed to replace TTYs in both in-house and communications applications. They are supported with the Plot-10 graphic software system. The two expanded terminals are designed to interface with IBM 360/370 systems and the DEC PDP-10.

Compatible minicomputers include the DEC PDP-8, 11, 12 and 15; all Data General minis; the Hewlett-Packard 2000A and 2100 series; the Varian 620 machines, and minis from Honeywell, Raytheon and Interdata.

The 4013 includes a "double-encoded" keyboard that allows the operator to switch from Ascii to APL as required. The terminal is supported with Plot-10 APL/Graph, Tektronix said.

The 4012 costs $4,950 or $250/mo on a one-year lease. The 4013 costs $5,450 or $275/mo. Second- and third-year lease renewals are available at reduced rates. Tektronix mailing address is Box 500, 97005.

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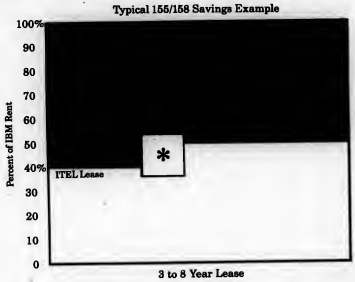

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CW SPECIAL REPORT

★The Mighty Minicomputer★

August 30, 1972

Elusive Mini Defies Definition, And That's a Sign of Its Growth

What's a Medium-Scale Machine?

One of the things you can't do with a minicomputer is define it.

Sometime in the Sixties, an unsung phrasemaker hung the term minicomputer on the small, relatively inexpensive processors that had appeared around 1965. Until then they had been known as small computers or dedicated application computers – a term soon to become quite inaccurate. The original minis were used in laboratory instrumentation systems for data reduction, and as process controllers.

An attempt at definition advanced at the 1968 Spring Joint Computer Conference claimed minis were stored program computers selling for less than $25,000. It was a pretty simple definition, and at the time minis were pretty simple machines. Their arithmetic and logical powers were nothing to write home about, their instruction sets were limited, and their I/O, memory and software were insignificant compared to large-scale processors.

It has been less than 10 years since those first minis crept out of Maynard, Mass., but since then prices have dropped by an order of magnitude, the speed and power of even the cheapest minis have grown to equal that of small, second-generation mainframes, and minis have become very flexible.

And the definition makers have been left by the wayside.

The price ceiling, for example, has fallen from $25,000 to $20,000, to $15,000, and some individuals now say a processor costing over $10,000 is a medium-scale machine, not a mini.

But while things are still pretty slippery, there are some general considerations most people in the industry would agree on . . . at this moment.

A mini is a physically small, stored program computer. Since it seems to take at least 4K to do any meaningful programming, it should have at least 4K words of memory.

Word length varies from 8 bits to 24 bits – most commonly 12 and 16 bits. The machines take from 2 to 12 µsec to perform an ADD, (but watch it, the number's shrinking fast.)

And a mini costs less than . . . take your pick, but remember the predictions of $500 minis by 1975.

One definition that has curled up its toes is the process control-instrumentation-based "dedicated application computer." The idea that a mini would be reserved for only one use died as soon as engineers and scientists – the minis' first buyers – found they had a usable calculator and a fun toy.

Some of the original programming for minis came from technical users who had to write their own applications software; they quickly found that, as well as doing phase analysis, the computers could play blackjack and tic-tac-toe.

Advances in semiconductor technology and development of large markets have accounted for the mini's definition-defying growth. The growth has worked two ways:

- Processors of power and architecture roughly equal to that of the machines of a few years ago can be sold much more cheaply. The bottom price for quantity purchases is now in the $2,500 to $3,000 range – and the manufacturers are still making money.
- At prices similar to those of a few years ago, manufacturers can sell machines of comprehensive power and flexibility. There's something of a speed race among the makers; ADD times have dropped under a microsecond, while nanosecond cycle times are the only way to keep up with the Joneses. Additional features such as floating point, direct memory access, multiplexer I/O channels, powerful software and a range of peripherals have become common.

These developments have made the mini useful for either very low-cost control and communication applications, or a moderately priced alternative to large-scale general processors.

Another tack mini-definers *[Continued on Page S/2]*

Welcome to a Wild World

In a field that is gradually losing the ferment of youth, the subsection called minicomputers maintains a boiling excitement and an explosive, adolescent growth. Price lists are a day-to-day affair; new products are a necessity for survival; companies appear and disappear with disturbing speed.

But more than that, users are constantly finding new applications for minicomputers. As prices tumble and peripherals and software improve, people are finding more ways to bring electronic data processing out of the computer center and into the office and factory.

This special report looks at minis – what they are and what they can do – and focuses on three of the most interesting of these application areas – small business systems, process control and data communications. It's a snapshot of where things are now, with a blurred peek at where they are going. One thing is sure, though; it won't be this way for long.

Varying Word Lengths—There Are Reasons

There's no universal 8-bit byte in minicomputers. The small machines are word oriented, and a mini word can generally be 12-, 16-, 18- or 24-bits long.

This may be a problem for data processing professionals who have worked in a strictly business environment and have never had experience with scientific computers.

But there are good reasons, both historical and practical, for the varying word lengths of minicomputers – and word length is a critical parameter in selecting the right mini for a particular application.

The main problem is the lack of a single optimum word size. Alphanumeric processing, process control and instrumentation can have different word-length requirements. In addition, machines with shorter words are generally cheaper than long-word machines.

Effect of Word Length

Word length determines the accuracy with which a machine can perform arithmetic operations without resorting to double-precision modes. It determines the size, and thus the sophistication of instruction sets. And it limits the size of memory that can be addressed directly without more costly indirect addressing methods.

In addition, certain applications provide input of specific type and format.

Currently the most popular word length is 16 bits, a size acceptable for alphanumeric application, and a good compromise between cost and precision for numeric applications.

A 16-bit word can hold two Ebcdic or Ascii characters or two TTY character codes, each with a parity bit – indeed, the 16-bit word is the same size as the 2-byte "word" used in IBM 360/370s. Minis vary in multiple-word arrangement, but frequently two words can be coupled to give a 32-bit data word.

The 16-bit word can also hold the direct addresses of a 2K memory.

The alternative to the 16-bit structure for byte-oriented applications is simply an 8-bit machine.

Eight-bitters are the cheapest minis in terms of memory costs, but they have some drawbacks.

In particular, the short word length allows direct addressing of only 256K of memory, thus requiring some scheme of memory management such as indexing or indirect addressing, or combining words for addressing.

The 8-bit word also makes the machines clumsy at arithmetic operations, because they have to use double words for any precision at all.

The 8-bit machines are the machines-of-choice for the extensive byte manipulation applications common in business. They can also handle variable-length data strings easily, and almost all the machines do have double-word procedures for commands and data.

The minis, however, are not identical to 8-bit byte 360s and 370s. They have no counterpart to the packed-decimal format used for data storage and decimal arithmetic in the larger machines, for example. In addition, the minis differ in their ability to handle data strings, since they can access them only one byte at a time; in the 360 the number of characters that can be accessed with one instruction is, within the limits of machine design, up to the programmer.

12 Bits

For a long time 12 bits was the most popular mini word length. This size was a compromise between cost and accuracy in scientific or process control applications.

The 12-bit format assigns three bits for operation codes and nine bits for addressing. Since the machines were frequently used for process control applications, the small instruction set available with three bits was acceptable.

Relative addressing allowed a total address range of 32K, and by judicious assignment of frequently used data to directly addressable locations, addressing overhead was kept to a minimum.

The 12-bit word permits a direct interface to many analog-to-digital converters, an advantage in instrumentation and process control. Using IBM's old, 6-character BCD coding scheme, the 12-bit word can also accommodate two alphanumeric characters.

The most powerful and flexible – and most expensive – word length available in minis is 24 bits. The length holds either three 8-bit Ascii or Ebcdic bytes, or four BCD characters.

The extra bits permit large instruction sets and extensive direct addressing. Unless an application demands this power and flexibility, though, a smaller machine is generally more cost effective, even with the overhead of indexing and indirect addressing.

PDP-1 Used 18 Bits

The first mini, the PDP-1, used an 18-bit word, a size no longer in common use. The reason for this size stems from the 6-character BCD code and the fact that early, Von Neumann-type scientific computers used a word twice as long – 36 bits. The large machines could hold six characters in a word, the PDP-1, three.

This first mini was designed as a very low-cost computer, and word length was one of the first compromises. By using double words scientific programmers could adapt to the PDP-1 easily, and its 18-bit word length allowed both a 5-bit op code and direct addressing of up to 8K words.

The variety of word lengths sprang from further compromises to this machine, as well as the change from the 6-bit BCD to the 8-bit character codes.

The 12-bit machines were a further cost reduction in 18-bit machines, for example, while 8-bit and 16-bit machines were adapted to 8-bit codes. The 24-bit machines can bridge the gap between the two encoding methods.

Special Report Index

Desirability Depends on Application

User Sophistication Means More Microprogramming

Microprogramming has been around for a long time; almost all modern computers have it. The hoopla over the past few years in the minicomputer business has been about *variable* microprogramming, or letting users get their hands on the microcode.

Microprogramming tells a processing unit how to perform an instruction. Just as the program steps for calculating a sine are contained in a program in main memory and are made up of elements like ADDs and JMPs, the microprogram steps for actually performing an ADD or JMP are included in a microprogram in a solid-state microstorage.

The microprogram steps define the relationships of individual logical components such as shift registers, NAND gates and NOR gates that produce the desired result.

In most computers these microprograms are fixed. It was a noteworthy advance when IBM added reloadable control storage (control storage is another term for the microprogrammed instruction set) to the 370/145 – the floppy disk. This is variable microprogramming, but only IBM can do the varying.

In the mini market, though, there are several machines that users can custom tailor for maximum efficiency and speed.

The user writes a new microprogram that will make an ADD instruction actually perform a square root, or writes a microprogram for a SIN instruction that will take the sine of a number – or does whatever his application requires.

Microprogrammable minis have one big advantage – speed. Microcode is maintained in a solid-state memory, generally the fastest memory in the computer. Running a code through the microstorage, then, is several times faster than running a subroutine from main storage.

There are two kinds of storage for microcode – read-only memory, where the microcode is loaded permanently as firmware, and writable memory, or writable control storage.

Writable control storage is potentially one of the most exciting and powerful features in minicomputers. Here the microcoding can be altered under program control. Midway through a run, instructions can be changed for optimum efficiency, for example. Or microcoding designed for a particular application can be loaded at the beginning of a run.

Theoretically, at least, it is possible to use writable control storage to make a mini emulate another mini – the ultimate in compatibility.

Prime Computer's Prime 200 mini, scheduled to be announced in September, will contain microcode that allows it to perform all the instructions of Honeywell 316 and 516 minis, as well as other, more powerful instructions. Its microcode is also designed in conjunction with its operating systems to optimize DOS or real-time performance.

Choice of ROM or writable control storage depends on application. If the computer is to be dedicated forever to one application, firmware is the answer. The program is loaded into microcode, and main memory is reserved for data. If the mini has to run several different programs, writable control storage is desirable.

Using microprogramming requires some user sophistication, and this may be why the concept has not had a huge effect on the minicomputer industry. There are indications, though, that its use will soon become more common.

In process control design, for example, it would be helpful to many users to have a high-level programming language designed specifically for process control that could be used by individuals familiar with processes, not with programming.

There have been attempts at such a language, but they have been rather inefficient, creating much overhead and using great chunks of main memory. With microprogramming, though, it is possible to create instructions specifically tailored to process control, and write an efficient and tidy programming language around those instructions.

The desirability of microprogramming will always depend on the application of the mini. A spokesman for Data General, whose machines are not microprogrammable, commented that "we have not found a way to save money for the customer through microprogramming," noting that the greater ease of writing programs for a fixed instruction set machine generally offsets the advantages of variable instructions. He added that microprogramming is wasteful of bits, and less efficient than subroutine calls.

Elusive Mini Continues to Defy Definition

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have taken is to insist that the machines be available, if not built exclusively, for an OEM market. In other words, this argument stresses the mini as a component, something to be used in a larger device, much as a transistor is a component in an electrical system.

The high-volume OEM market has been crucial to the development of the minicomputer. As the makers started out, they relied on OEMs for system construction. The mini makers knew (or were learning) how to build minis. They didn't know how to build process control or lab instrumentation systems, and they didn't have the capital to build the systems anyway. Almost all the mini manufacturers relied on OEM business for a start.

As contracts came in and a little money became available for development, most manufacturers devoted some effort toward building systems, or at least developing system components such as assemblers, languages and application packages, and specific peripherals and interfaces.

Digital Equipment, daddy of the mini, was one of the first to develop what are now called turnkey systems. DEC offered DEC packs, (systems including hardware and software) for a number of its clients, particularly instrumentation and laboratory systems.

DEC packs were also offered for process control applications and specific industries, such as a typesetting package for printing and publishing.

Gradually, the minicomputer houses have taken on specific identities. Some are known for concentration in instrumentation, some for time-sharing expertise, or familiarity with data communications or real-time systems.

Some remain primarily OEM manufacturers, while others have a bigger end-user mix. Some are known as engineers' companies, others as salesmen's. What this means is, no matter what the user's need, there's somebody out there likely to be able to fill it.

So minicomputers, and the systems they inspire, continue to evade definition. Many people in the industry seem to enjoy this fact – it's a sign of the volatility and the growth of the business they make their livings in. It's a symbol of the challenge of their daily work.

Maybe, when someone finally pins the mini down, it won't be quite as much fun anymore.

The central processing units at Shenandoah Downs racetrack in West Virginia use Varian's 620/i minicomputers to keep wagering time to a minimum.

Mini Proves It's a Good 'Sell'

One of the most successful ways in which minis have been used in business is through sales terminals – smart cash registers that handle various types of transactions, lead their operators through data entry steps and check credit automatically.

There are two major reasons users are looking to intelligent sales terminals – the cost of training operators in the many different types of transactions possible – cash sales, credit sales, delivery, lay away, returns for credit, returns for merchandise, and so on – and the savings possible through tight credit controls – catching bad cards and instituting zero floor limits.

The systems also provide more management information – for inventory control, for example – and are frequently faster than plain cash registers.

The sales terminals themselves frequently have some programmable processing power, but this is generally limited. A terminal can automatically figure sales tax, and the tax rate can be changed in some machines easily.

Minicomputers come into their own as the controllers of groups of terminals. It is the mini's power to perform on-line disk searches that enable rapid credit checking. Minis can analyze transaction data for relay to shipping departments, inventory control section, and for inclusion in management summaries.

Most of the major sales terminal systems can be run by a mini, often in communication with a larger CPU.

Simpler Machine Better Adapted to Simpler Use

Are you sure your big, general-purpose computer is giving you value for the money? If the company president told you he could get a computer with half the add time, a larger memory and just about the same cycle time and I/O rate as the new beauty with which you just replaced two 30s – for a fourth the cost – what would you say?

Well, it isn't quite yet time to turn in that 370/135 for a PDP-11, but what *does* the 370 have that the mini doesn't? That $73,000 in the accompanying chart includes optional goodies such as hardware floating point, multiply/divide, four hardware interrupt levels, a multiplexed direct memory access and even a TTY.

Don't fret, there are plenty of reasons why you still have to pay almost $297,000.

Flexibility

The main feature of the large system is flexibility. The range of peripherals and software available for the 370 is unmatched by any mini system. And the peripherals and software themselves are much more productive than anything for a mini. In terms of total system output, even two PDP-11s couldn't beat the 135.

There are simple hardware advantages, too. The 370 offers decimal arithmetic – available on only a few minis – and standard storage protection and parity checking. It can handle packed data – something beyond the mini's powers, and its instruction set is much more powerful than the mini's.

(As an example, on the 11/40, multiply/divide is normally done by setting a trap and going into a software subroutine. Even when equipped with hardware multiply/divide, the system must go through the same procedure of setting a trap and trying to go into a

(Continued on Page S/5)

Features	DEC PDP-11/40	IBM 370/135
Cycle Time	900 nsec	770-975 nsec
Add Time	900 nsec (16 bit)	4.21 msec (32 bit)
Floating Point Add Time	20 msec	13.73 msec
Maximum I/O Rate	17.6 Mbit/sec	19.2 Mbit/sec
Registers	8 general purpose 8 index	16 general purpose 4 floating point
Memory	2,048M bits	1,968M bits
Instruction Set	79	107
Price	$73,745	$296,780

Comparison of Large and Small Systems

Core vs. Solid State: Hybrid Memory May Be Solution

The controversy over core versus solid-state memories is still going on.

Solid-state memories cost less than core, according to Randy Gillam of Texas Instruments, a manufacturer of solid-state devices, and they can be packed in higher densities to permit smaller processors.

But core is cheaper, as well as more reliable, noted Larry Seligman, an engineer at Data General and a designer of the Supernova. Seligman feels the optimum solution is the combination of a large core memory with a small, high-speed solid-state buffer. This approach can come very close to the quick cycle time of a pure solid-state memory, he stated.

Everyone agrees solid-state is the only way to go for the fastest cycle times possible. If you need faster than 600 nsec, only semiconductor memory can offer them.

And almost everyone agrees slower core is cheaper than faster semiconductor memory, and that core technology is well-known to computer designers. Another advantage of core is the availability of suppliers, Seligman said.

Seligman noted that the lower production cost of core recommended it for minicomputer use. Gillam, however, pointed out core production cannot be automated – each core has to be strung on a wire matrix by hand. It is necessary to use smaller cores to make core cycle times faster. This makes the memory more expensive to manufacture, Gillam said. Solid-state memories, on the other hand, are produced by an automated process.

Seligman dismissed the arguments that solid-state memories take less space and use less power. At present, he said, power consumption and volume capacity were just about the same for equal size memories of both technologies.

Gillam disagreed about power consumption, and added that semiconductor memories do not need several different voltage sources, making for simpler and more reliable power supplies.

But Seligman refused to advance the argument that volatility is a major problem with solid-state memories.

Most minis don't have a volatility problem, he said, since their applications generally can be restarted with little loss of significant data. If data must be preserved in a particular application, auxiliary disk storage and frequent checkpoints in the application program can remedy the problem, according to Seligman.

In those cases where continued mini power is crucial to an application, system security demands the mini be equipped with a standby power source anyway, he noted.

Gillam added there are ways around the volatility problem. Texas Instruments' latest minis are equipped with a battery that can maintain a 16K memory for two weeks – possible because it takes only about one-thousandth as much power to maintain a memory as it does to use it in normal operation.

Seligman admitted that, in the future, semiconductor costs would probably drop below core costs, and density would rise. But he felt core would still be around for a long time; the technology is still being developed, he said.

Today's best solution, he said, is a hybrid memory, combining a small 300-nsec semiconductor buffer with a large 800-nsec core main memory. Given a properly designed program, this memory operates nearly as fast as one composed entirely of 300-nsec semiconductor elements.

Core will eventually reach its maximum speed when the power supply circuitry necessary to give a sufficiently fast current rise time becomes prohibitively expensive, Gillam stressed.

Better Not Sell That Mini Short

(Continued from Page S/4)

subroutine – only it goes into hardware instead. The programmer can't get rid of those wasteful extra steps. Minis abound with quirks like this.)

But while there really is no way to replace the 135 with minis, the smaller computer can outstrip its big cousin in some applications. The faster add time alone indicates that a program calling primarily for repeated additions could be done better by the mini. The rule of thumb seems to be that the simpler machine is better adapted to simpler applications.

More complicated tasks, involving many logical and arithmetic steps, wide-ranging memory fetches, high-precision computation, fancy data manipulation, bit pushing, etc. are more properly the province of the more complicated processor.

The comparable I/O rate also indicates the mini would be more cost effective in situations calling for chunking things through the processor and into memory, and then out again – such as message-switching and controller applications.

But how long will that last? PDP-8s are running seven levels of multiprogramming right now. Cmdr. Grace Hopper has been saying for years the giant processors are dinosaurs, and that systems of minis are the only way to get out from under their large and threatening feet.

Mini processors, software, peripherals – and microprogramming – are getting better every day. Perhaps in five years the system designer will be contending with an entirely new set of problems.

Before You Buy Any More Read Our Data Communications

The picture shows part of Data General's data communications product line.

The whole line is described succinctly in our data communications price list.

It gives you basic specs, prices, hardware prerequisites, and service contract prices.

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It starts with the Nova minicomputers—versatile tools you plug into a system anywhere you need to do a complex communications job reliably and economically.

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There's a multiprocessor interface that ties a string of Novas into a powerful processing network.

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We've got whole pages of communications-oriented peripherals: hardcopy and CRT terminals, the super-reliable Nova-disc, our

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But there's no software on the price list: it's available free with the hardware. Each communications interface has its own software package, and with any computer with over 12K of memory you can get Realtime Disc Operating System (RDOS) or Realtime Operating System (RTOS). They have all the tools you need to write your application programs.

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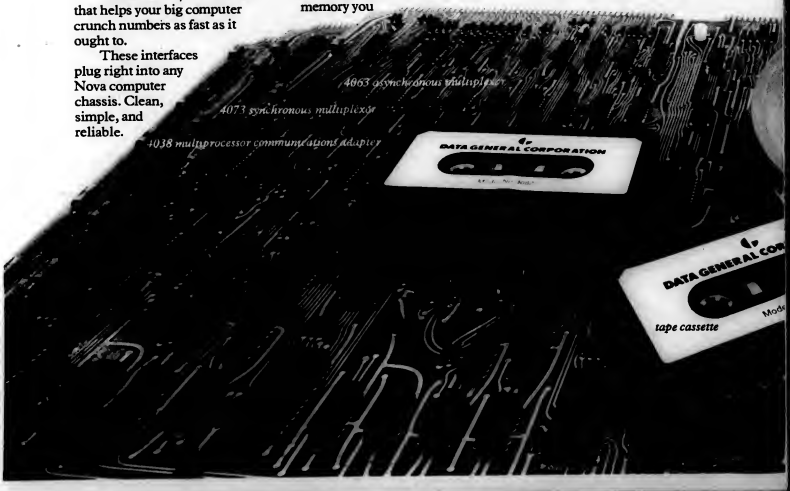
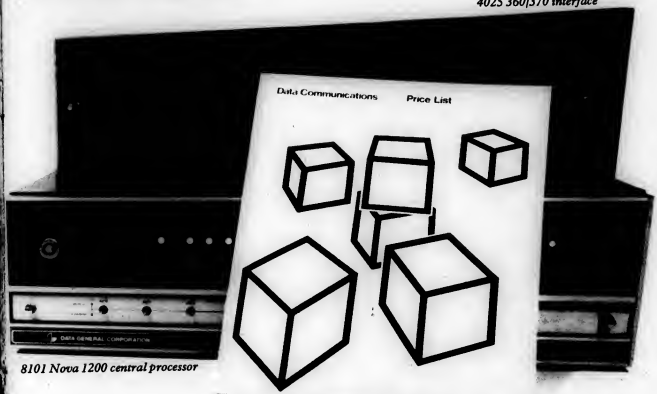


Communications Hardware, Just Price List.



4025 360|370 interface

8101 Nova 1200 central processor

price list

tape reel

☐ Send price list.
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Small Businessmen Get Special Care From Vendors

Computers are moving into the office. So what else is new, you ask? Well, the offices are very small. Businesses with revenues in the $1 million class, outfits with a dozen employees are beginning to buy their own computer systems.

The computers are very small, too.

As well as a few thousand IBM System/3s, NCR 50s and Honeywell 58s, there are about 1,500 to 2,000 minicomputer business systems in use today.

They are being used as true general-purpose computers, running a range of applications such as order entry, sales analysis, payables, receivables, general ledger, inventory control, payroll, price ticket printing and, credit authorization – even such relatively esoteric applications as linear programming.

The mini is becoming more than a box to run a remote batch terminal; people are discovering it is a powerful machine, capable of multiprogramming, large I/O volume and great cost-effectiveness.

Where They Come From

Several sources sell mini business systems. Leaving aside, for the moment, the mainframe manufacturers like IBM, NCR and Burroughs, mini systems come primarily from two sources – mini manufacturers and independent systems houses.

The mini makers are the sources of the mainframe, frequently of the peripherals (a mini system typically has a disk, a CRT or keyboard terminal and often a line printer and card equipment) and the software packages that go into a business system.

The mini makers are primarily hardware manufacturers, though, and often prefer volume sales and OEMing to the rigors of handholding with small businesses – which have often had no experience with data processing at all.

The Systems House

This chore has been taken on by the systems houses which offer turnkey systems. They analyze the customer's needs and take full responsibility for selecting hardware, writing software, putting the pieces together and making the system run. They offer something few hardware manufacturers are interested in – guaranteed performance.

If the system doesn't work up to agreed specifications, the user doesn't pay a penny.

So it has been a group of small entrepreneurs who have broken the path to the small businessman's door; Ultimacc and Scidata and Qantel aren't exactly household names.

And fear of the computer is not a negligible factor in this market. One Miami user – eventually converted by a systems house – spoke of going to Atlanta to see a System/3 perform.

"I didn't know anything about computers," he said, "and I walked in and it was a card system. I saw this girl walking around with a tray full of cards, and I thought to myself, 'now what's going to happen the first time my secretary drops those cards?' Then I turned around and walked out." The gentleman is now very happy with his own computer – which uses a CRT terminal for data entry.

Of course, this was a reaction born of fear and ignorance. But it's not uncommon. The office manager who sees himself put out of a job by a computer, or having to contend with DP types who talk Cobol instead of English, or saddled with a taxing rental and a DP system that takes over his world needs "special care and feeding."

And the vendors of mini business systems are finding ways of giving him this special care. Guaranteed performance is one way. Another is tailoring a system specifically to his needs, giving him the applications programs he wants, just the right amount of hardware to do the job, and letting hardware sales and upgrades go hang. And if the user doesn't want cards, the world doesn't have to revolve around cards.

The size of this small business market hasn't really been measured.

Mel Posin, assistant general manager, marketing, at Lockheed Electronics, talked about the particular submarket the Lockheed-Continental Casualty system is aimed at. There are about 80,000 independent insurance agencies in the U.S., according to Posin.

Of them, about 15,000 to 20,000 could justify spending $1,000 to $1,500 a month for their own DP system.

Vendor interest in mini-based general-purpose systems is fairly recent. *Computerworld's* 1969 supplement on minis said: "Mostly they are used in the on-line, real-time environment, and are built into larger systems as special-purpose data reducers and controllers." Business data processing on a mini was mentioned as having just become a possibility – for the future.

Industry figures ascribe the boom in general-purpose systems to several causes, among them:

- IBM's System/3 – IBM sanctified the market with its small system, and is conducting a major user education campaign. And, incidentally, it is selling a great many systems – about 6,300, 3/6s and 3/10s, as of the beginning of the year, according to *EDP/Industry Report*.
- Reduced peripheral prices – Lack of adequate, low-cost peripherals stymied system development for quite a while; even two years ago it was not uncommon to find a $90,000 system driven by a $10,000 mini.

Since then, though, the mini peripherals market has started bubbling, as the mini manufacturers have broadened their product lines and independents have entered the battle. Prices, even in the last six months, have fallen drastically.

- Mini-maker economics – Almost since the creation of minicomputers, their manufacturers have had to contend with constantly falling unit prices. In order to keep up revenues and profits, the manufacturers have had to move from CPU sales, to CPU and peripherals sales, to system sales; Honeywell's bundling of its minis into the 700 systems is a prime example.

Development of systems, which include peripherals and software, has given designers a wealth of low-cost products from which to create systems.

But the mini itself is disappearing. In dollar value, the CPU is becoming an almost negligible part of a system.

According to one industry figure, in a general-purpose system the CPU value runs from 10% to 25% of total hardware cost, and from 40% to 60% of system cost is hardware. The processor, in other words, represents 4% to 15% of total system cost.

This is not surprising, since in OEM quantities minis sell for less than $3,000. It is an indication, though, that the mini is on its way to becoming an inexpensive, common component of many systems in the business area.

Mainframers or Independents? Choice Depends on Maintenance, Software...

The small businessman has a choice: to buy the hardware and services of a mainframe computer manufacturer, or to turn to a mini manufacturer or systems house to design a system specifically for his needs.

The majority of businessmen go the first route. Mainframers like IBM, NCR, Burroughs and even Honeywell and Univac have continuous sales contact with a large number of small businesses, and have great success upgrading office equipment and accounting machine customers.

The five manufacturers all offer entry-level DP systems – that may or may not be minicomputers:

- IBM's System/3 Model 6 is an 8-bit machine available with 8K to 16K of core. It has a cycle time of 1.5 *µsec* and a decimal add time of 12.2 *µsec*. It runs RPG and Basic, and a number of business application packages are available; IBM charges for software. An 8K system with disk, printer and keyboard costs about $47,000.
- NCR's Century 50 is also an 8-bit machine, with from 16K to 32K of 800 nsec short rod memory. Decimal add time is 37.6 *µsec*. Software is bundled into hardware price, and application programs, utilities and Basic, Cobol and RPG compilers are available. With disk, card reader and printer, a 16K Century 50 costs $95,000.
- Honeywell's European Series 50 Model 58 is another 8-bitter, with memory from 5K to 10K. Cycle time is 1.2 *µsec* and decimal add time is 120 *µsec*. Software is bundled, and Cobol and applications programs are offered. With 5K of core, disk, line printer, card reader, keyboards and display, a Model 58 sells for about $60,000.
- Univac's Model 9210 is an 8-bit machine with from 8K to 32K of 1.2 *µsec* plated wire main memory. Decimal add time is 86.4 *µsec*. Software is free, with Cobol, RPG, utilities and applications programs available. For about $52,000 a user can buy a 12K CPU, line printer, card reader, card punch, disk and a hardware multiply/divide feature.
- Burroughs' smallest B1700 system, the 1712, has from 16K to 40K bytes of 500 nsec main memory. Decimal add time varies because of the dynamic nature of the microprogrammed machine. Programming is done exclusively in Fortran, Cobol, Basic or RPG. The separately priced software includes extensive applications packages. A $70,000 system includes a 16K, 8-bit machine, card reader/punch, line printer, disk and console printer.

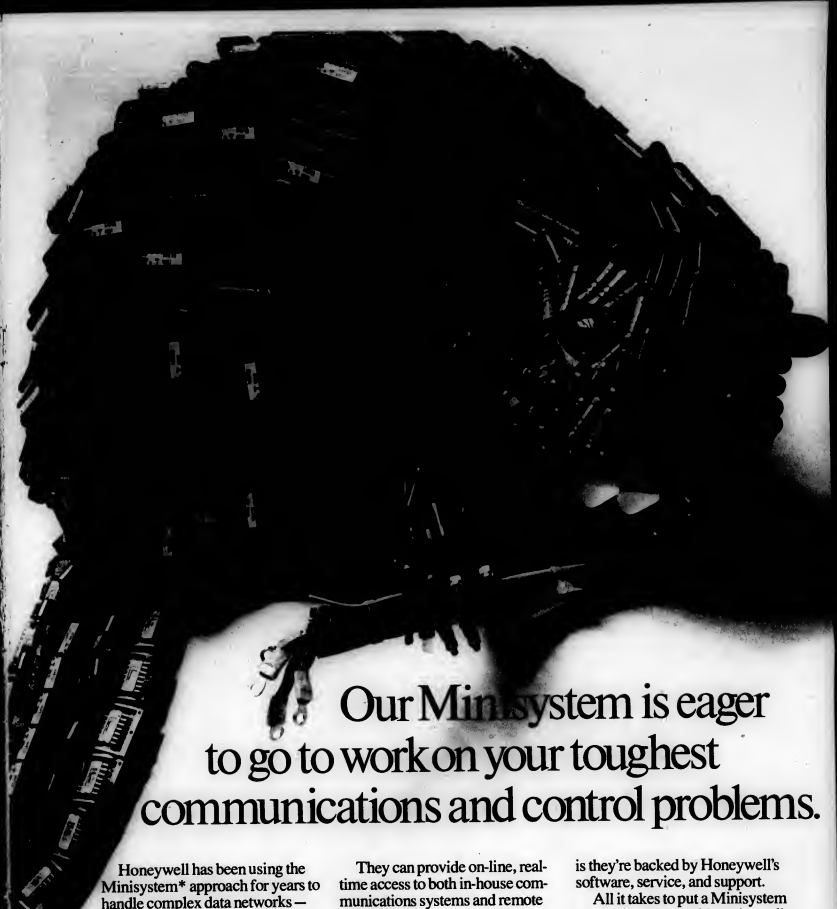
At $50,000 to $100,000, the mainframers and the independents are roughly in the same price ballpark. The choice between the two types of vendors has to depend on other criteria:

- Software: Do the generalized applications programs from the mainframers suit the users' needs, or is extensive programming required?
- Maintenance: Can the independents provide field engineering support comparable to the mainframers?
- Upgradability – How easily can the user increase the power of his system if the need arises? (Notice that the mainframers' systems may not be entirely program compatible with larger machines, and their advantage may not be clearcut.)
- Performance – While the mainframers' systems all have decimal arithmetic, a feature most minis don't offer, the tailored systems from independents often have better overall system performance.

About the Author

This special report was prepared by Michael Merritt, a free-lance writer specializing in computer industry subjects.

Merritt has worked with EDP since his graduation from MIT in 1969. He has been associated both with *Computerworld* and its parent, the International Data Corp., and his articles have appeared in a number of journals in the U.S., England and Japan. He is currently based in the San Francisco Bay area.



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Turnkey Business Systems Can Offer That Little Extra — Peace of Mind

Turnkey systems are nothing new to the computer industry; they've been around almost as long as computers. But the application of the turnkey approach to small business systems has an uncommon importance. It provides users inexperienced in data processing with the needed security to make the jump into EDP.

When a firm bids a turnkey system, it is offering to take all responsibility for filling the user's needs. After deciding with the customer precisely what the system's output has to be, the turnkey bidder selects hardware, writes software, provides interfaces and trains the customer's staff to operate the system. Until the system is operating up to contract specifications, the user doesn't have to pay the system supplier.

This approach means that the EDP-naive user doesn't have to become an expert in computers in order to install a working, efficient system.

Users of turnkey business systems interviewed by *Computerworld* were enthusiastic about the technique.

Herbert Klapper is in charge of the system installed by Ultimacc for the Superior Sewing Machine Co. of New York. Superior stocks parts for sewing machines, and has an inventory of thousands of separate items. Individual orders are generally quite small, Klapper said.

Klapper's system, based on a Data General Nova 1200, performs inventory control, accounts payable and accounts receivable. Payroll is being implemented and purchasing applications are planned.

Money Saved

Before going to the Ultimacc system, which lists in the $50,000 to $60,000 area, Superior had been paying $42,000 a year to service bureaus. Not only is the system saving this money, Klapper said, it has also freed up two office workers.

"We're overcomputed," Klapper said. "I ordered two [CRT] data input stations. They told me I only needed one. But I thought, what would happen if one of them stopped working, so I ordered two. I only need one. We can increase our input 30% to 40% before we even need that second station."

The system is processing about 1,250 invoices a day, and could do much more, he added. (Ultimacc said the machine can process over 10,000 items a week.)

Klapper said his supplier serviced him well, and is supporting new programs.

In Miami, Marsha Kay Corp. uses a system provided on a turnkey basis by Scidata for inventories, invoicing, accounts payable and receivable, general ledger, mailing lists and price ticket printing. The system is based on a PDP-8.

Manuel Seff, in charge of the system for the wholesaler of costume jewelry, said, "I didn't even know what a computer was. I got a brochure in the mail (from Scidata) and it was the only thing I could understand out of all the material I had gotten on EDP."

Good Service

Seff, too, was enthusiastic about the service he was getting on his guaranteed performance contract. Scidata is "very responsive," he said, and the system is paying for itself.

He scored the mainframe manufacturers who "weren't interested in you if you weren't willing to spend $1 million." Marsha Kay has about 6,500 inventory items and 1,500 accounts receivable.

Winkelman's in Detroit, has installed a credit authorization system on a turnkey contract from Datatrol. Its system, based on a PDP-8, was installed at the end of August, 1971, and was accepted a month later.

It is a communications system, connecting 37 of the women's wear stores. Touch-Tone pads at registers talk to the computer, which maintains a credit history file. A questionable charge is displayed on a CRT in front of a credit officer, who also has automatic phone contact with the register operator.

The Ultimacc business system includes disk, CRT and a CPU in the desk.

N/C machine tool operates under direction of System Gemini. Data entry unit in foreground inputs to Interdata 70 mini.

Controllers for Two Processes

Mini in Charge on Factory Floor

Data processing in the plant and on the factory floor is slightly different from DP in the computer center. Process control involves sensors and transducers, not keypunches; real-time operation, not batch; and output of control signals as well as printout.

There are basically two kinds of computer systems in the factory, according to Jim Folts of Interdata. The first is continuous process control, as found in a refinery or chemical production plant. It involves control of a continuous process, generally through altering the flow of liquids.

The other type is a factory automation installation. This covers the manufacturing of discrete parts, and includes activities such as numerical control, production monitoring, data collection, stacker crane control – putting parts into bins, keeping track of them and taking them out of storage – and many phases of automatic testing.

Minicomputers enter the scene as controllers for both types of processes, and they can bring both greater flexibility and greater economy to manufacturing systems.

Process Control

In continuous process control applications, for example, instrumentation is already in place. An operator at a control board monitors temperatures, flow rates and the like throughout the plant. And he controls the plant through various servo systems that open and close valves, and raise and lower temperatures. A large part of his work may be performed by automatic analog controllers – hardwired devices designed specifically for a particular application.

The mini takes over the functions of the hardwired controllers, and part of the work of the human operator. The advantages of the computer over analog controllers are several: minis can accommodate more complex and accurate algorithms – calculating a square root is difficult for an analog device, for example; minis, through use of real-time clocks, can introduce long and relatively accurate time delays into a process, another task analog controllers find difficult; and minis can handle many more I/O channels than analog devices of comparable cost, which are generally limited to a maximum of three or four inputs.

Data entry unit for System Gemini shows alphanumeric readout display together with 16 decade-type selector switches for data input. System Gemini, built around an Interdata Model 70 minicomputer, can direct up to 30 N/C machine tools from any manufacturer.

The minicomputer's main advantage over a human is consistency, according to Folts. A mini may not be able to beat the best performance of a human, perhaps because of its limited data inputs, he noted, but it performs well regularly. "The computer doesn't come in on Monday with a hangover," Folts added.

In process control, then, the minicomputer can fine tune a system, squeezing a few percent more yield out of a process, and justify its cost on a pure dollar basis.

Factory Automation

In factory automation, greater flexibility is more often used as an argument for moving to computer control. The functions computers perform here are more similar to business data processing than are the process control functions. Keeping track of parts, tallying up job sheet costs or calculating work hours all deal with the storage and analysis of discrete facts.

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Mini in Charge on Factory Floor

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So, naturally, one argument for bringing the computer to the factory floor is that EDP can bring better control to the work situation – MIS for the production manager.

In many areas of factory automation, minis also supplant hardwired controllers, particularly in numerical control, probably the most common factory automation application, and in quality control testing.

Numerical Control

A numerically controlled tool – a lathe or drill press – has a controller that reads instructions from a punched tape. The controller converts the information into signals that actuate servos to run the machine.

Minis can enter the process in two ways. In behind the tape reader systems – called BTR in the industry – a transmission line from the mini takes the place of the tape reader. A mini can take the place of several readers, and control a number of machines at once. The mini also eliminates the need for keeping many tapes on the floor for frequent changes.

The mini also operates interactively with the machine control unit. Here the mini not only provides rote instructions to the controller, but it also receives data on the status of the machine, as well as input from a human operator.

The mini can alter commands quickly to suit operating conditions, it can be reprogrammed easily to produce new parts because of its conversational ability, and it can provide a wealth of management data.

Of the two types of numerical control systems, BTR is cheaper because of lower programming costs. Systems with conversational and feedback capability are potentially the most profitable for the user, though, in applications involving production of many parts or rapid change in parts programming (creating the machine tool's control instructions).

Some Questions

The value of the mini in a parts-producing job shop has not gone unquestioned. The combination of computer and numerical control has been called a shotgun marriage by E.R. Reese, vice-president of Digital Systems, Inc.

According to Reese, minicomputers have several faults:

- To justify the cost of adding minis, the computers must replace controllers or tape readers on several machines. They are a capital addition to shop equipment that do not "increase cutting speed, chip production or spindle horsepower," and can be justified only in large shops.
- If a mini is running several machines, CPU failures, disk crash or the like brings the whole shop to a standstill. And reliability is a major problem in centralized systems.
- The shop has to hire new personnel for software maintenance.
- Without backup memory – such as original paper tapes – loss of the parts programs maintained on tape or disk would be catastrophic.

R.C. Doane, NC product manager for Digital Equipment, rebutted Reese's arguments. Doane noted that minis provide fringe benefits, such as management data and on-line creation of parts programs, that help justify their cost.

He added that bringing in personnel with new skills is part of the entry cost into new technology. Hierarchical systems of minis, Doane stated, alleviate the problem of CPU failure halting all work. And, he noted, "If information loss from . . . disk or . . . tape was an important problem, banks and insurance companies would be forbidden by law from using them."

Reese's objections to mini control, though, do point up the fact that they are an expensive addition to a shop. Many smaller operations may not find them cost effective. Only analysis of individual applications can actually answer the question of whether to buy minis or not.

Folts of Interdata said that since minis are more accurate than hardwired controllers, it is often necessary to replace sensors in a system with more sensitive models.

As a general rule, he said, the cost of new instrumentation equals the cost of the computer system. And, he said, hardware constitutes only about a third of the computer costs; another third goes for process analysis and development of control algorithms, while the rest is used up in programming.

Reese also said that replacing a $7,800 conventional control system with a $5,000 minicomputer is attractive only as long as the user doesn't add in software and interfacing costs.

Considering all types of mini control applications, Dudley B. Hartung of Management Methods, Inc. noted that the decision of going the mini route must be based on dollar per function costs and reliability and maintainability.

Don't Forget the RTOS

The quality of the real-time operating system for a minicomputer may determine whether it is wise to move to mini-controlled factory automation.

Software efficiency and reliability are uniquely important in production control applications. Business DP, instrumentation, and even communications, can tolerate errors or crashes much more easily, since they either operate in batch mode or have other computers for backup. In the plant, though, incorrect or tardy computer response can destroy valuable goods, and stop production.

Many major mini manufacturers offer real-time operating systems.

The systems differ in size and purpose. Data General's system, for example, is small in size – it takes 2K words of core – and price – it's free – but it is not very flexible. Other systems can cost more than a mini – HP's RTE costs $6,000 – and take up to 16K words of core, as does DEC's RSX-11C.

Besides software price and core requirement there are several capabilities to consider in selecting a system.

Range of Peripherals

The first is the range of peripheral devices the system will support.

Some do not support analog-to-digital and digital-to-analog convertors, and require special interfacing to read sensors and run servos.

To measure performance, the user should check interrupt inhibit time, the number of levels of priority interrupt available and the number of program call functions and operator commands.

If part of the cost justification for moving to mini-controlled numerical control is the efficiency of on-line parts program creation, the user should check whether the operating system will indeed handle on-line task setup, and it if will allow on-line task control for program development.

From Wire Wrapping to Running a Mill - Mini Does It

Wire wrapping, welding trucks, running a paper mill – all done by minicomputers.

The Electronic Engineering Co. in Santa Ana, Calif., is using a minicomputer to produce numerical control tapes for three semiautomatic wire wrap machines. The company went to a mini to increase production. An IBM 1130 was already operating to capacity running the machines, but EECO found it cheaper to replace the IBM system with a mini rather than expand it or go to a larger machine.

Throughput Jumps

Throughput has almost tripled in the six months since the company installed the mini, a General Automation Disk Monitor System based on an 18/30 processor, according to Don French, senior engineer at EECO. The system also provides more software documentation – analysis of wire-wrapping jobs – for customers.

French noted that conversion from the 1130 to the 18/30 was "no problem," and that except for one machine language program and one card change, the 1130 software was simply reloaded on the mini.

Welding and Lasers

Cabs on 1973 Chevrolet trucks will pass through an assembly line with 110 automatic welding stations, and the welding will be controlled by a system designed by Weltronic Co., using a Computer Automation Alpha 16 computer. At an assembly rate of 55 cabs an hour, the computer will perform and monitor over 6,000 welds an hour, while accepting input data from some 3,000 input sensors.

A prime advantage of the system, according to Weltronic, is its ability to monitor power conditions, preventing the welding guns from operating until there is sufficient voltage. This precludes the possibility of bad welds. The computers control firing time for each welding station, the thickness of the weld and other quality control factors.

The computer also monitors available line voltage, and organizes gun firing to make optimum use of power, lowering Chevy's electric bill.

In another Chevrolet plant in St. Louis, Mo., the Delco Electronics Division has devised an automatic wheel alignment system for passenger cars. The system uses lasers, and is controlled by a Computer Automation Model 216 mini.

Computer printout tells an inspector if alignment is correct, or precisely what adjustments are necessary. Repeated deviations in alignment cause the computer to notify an inspector stationed further up the assembly line that there is a production fault in his area.

Paper Making

A Varian 620 mini is the heart of a papermaking control system developed by Electronic Automation Systems.

The difference between a profit and a loss in papermaking can depend on a fraction of a percent of fiber weight or moisture content, according to EAS. If paper is being sold by weight, the papermaker wants moisture content to be as high as possible for a particular paper grade; if it is being sold by reams, he wants to regulate production to minimize the amount of fiber and additives used.

The mini-controlled system determines slurry feed rate and dryer heat to optimize these factors. As well as flow and consistency, the system can monitor refiner ampiers, web breaks, mill speed, slice positions, pressure and level. As the paper goes through the mill the mini detects or alters its weight, thickness, opacity, porosity, color brightness, gloss and roll hardness.

...Some Mini Terms And Words That May Confuse Some DPers

Since minicomputers are in some ways more primitive than large-scale processors, some concepts and terms are used in the mini field that DP personnel may not know. Some of them deal with internal characteristics of the machines, while others deal with options to overcome limitations of the stripped-down processors.

Because minis typically have short word lengths, a good deal of attention is given to the problems of addressing particular memory locations. The number of directly addressable words is a simple function of the number of bits given over to addresses.

If only eight bits are allowed, only 256 memory locations can be directly addressed. Direct addressing is the quickest way to read memory.

There are several schemes to get around the addressing problem. One is indexing. With this, the address in the word is added to a number kept in an index register to produce the actual value of the address location. The number of index registers in a mini using this scheme is a measure of the mini's flexibility.

The index registers may be special registers, portions of main storage set aside for indexing, or general-purpose registers – accumulators – that also serve indexing functions.

Another alternative is indirect addressing, where the specified location in the instruction word actually contains the address of the desired memory location. This way all the bits in a word can be used for addressing. The data in the second address may either be an operand or still another address, which becomes a multilevel indirect address.

Another means of saving a memory cycle is the use of immediate, or literal, instructions. Here the address portion of the instruction word doesn't hold an address, but an operand. This saves storage space, and obviates one memory cycle.

I/O word size is the number of bits transferred in parallel in an I/O operation: it is almost always the same as the machine's word length. I/O word size determines the ease of interfacing to peripherals, and affects the data transfer rate as well.

Direct memory access – DMA – allows I/O operations to go straight to or from memory without having to pass through a register in the CPU. Once initiated, memory transfer proceeds, independent of program control. This gives a high data transfer rate and cuts down overhead drastically.

Program interrupts are critical to a mini in a real-time application, and are the standard means for handling I/O operations. An interrupt is a signal to the CPU control section to suspend program execution and attend to the condition causing the signal. This can be an internal condition such as parity error, power failure, illegal instruction or the like, or signals from external devices, such as a disk indicating it has finished reading a record, or a process sensor signaling a dangerous condition.

Mini's Role: the Cost Saver

Excitement Over Data Communications Well Justified

Minicomputer control of data communications is one of the hottest areas in the minicomputer industry today. Research reports regularly call for an exponential rise in the use of minis for communications, and mini manufacturers are devoting a great deal of research and development to communications applications.

Yet conventional wisdom has it that there are only about 700 computer users in the U.S. with teleprocessing systems. So what's the big deal?

For one thing, those 700 are the largest and most advanced users in the country. Their DP expenditures amount to several billion dollars a year, and they have the budgets to develop new and cost-effective systems. And they are also the vanguard, using now the systems that may be common in a few years.

Couple this with IBM's marketing and product emphasis on teleprocessing, and the reason for excitement over data communications becomes a little clearer.

Mini as Cost Saver

The role of the mini in communications is a cost saver. Users are confronted with two facts of life they can't alter – IBM and AT&T. Minicomputers have given users a way to get around the limited product offerings of one and the unavoidable line charges of the other.

Minicomputers are used in four broad types of data communications equipment: remote concentrators, front-end communications processors, message-switching systems and intelligent terminals.

Remote Concentrators

Data communications systems generally involve several different remote terminals connected to a central computer by telephone lines. The most common terminals are teletypewriters that operate at 10 or 15 char./sec transmission speeds, and IBM 2741 Selectric terminals that operate at 14.8 char./sec. These are low speed terminals; telephone lines of the cheapest sort can handle much higher transmission rates.

The remote concentrator takes these low-speed terminals and brings them together on one telephone line by some multiplexing arrangement.

The purpose, obviously, is to save the cost of having a separate phone line for each terminal.

Some computers, though, and some operating systems, are not able to accept this multiplexed data. One of the functions of a mini in a remote concentrator is to convert the transmissions into a format suitable to the central processor, to make the multiplexed transmission appear to the computer as the input from one high-speed device.

The mini performs other tasks, as well. It can edit and convert codes into the native format of the central processor, relieving the CPU of that chore. TTYs, for example, use a code structure entirely different from that of a 360/370. The mini can make the TTY look to the CPU like a "kissing cousin from Poughkeepsie."

Other repetitive tasks, such as error checking, data compression and temporary buffer storage can be taken over by the minicomputer.

Front End

The remote concentrator is out in the field with the terminals; the front-end processor sits right in the DP center and serves as a CPU's interface to the teleprocessing world.

The front-end processor – always a programmable device – takes over the lion's share of communications controlling from the CPU.

Lines from various terminals and remote concentrators end at the processor, and the processor in turn gives "clean" data to the mainframe – or mainframes – at the central facility.

The front end converts codes, checks for errors, strips out transmission control characters, resolves differences between various transmission speeds and techniques, maintains records of message traffic, polls and addresses terminals and serves as a buffer for the CPU to maintain an efficient flow of data.

Special Program

Many of these functions are normally performed by the CPU with a special program, such as IBM's BTAM or QTAM. These programs can consume large amounts of core memory, and the overhead for the computer in terms of interrupts and delays can be significant.

Since the functions involved do not require high-level processing, minicomputers in front-end processors have been able to save users money regularly, and have extended the useful life of their CPUs.

Besides the economics, there may be other reasons for moving to a front end. They present a standard I/O interface, for example, so that programmers don't have to constantly adapt software to new terminals.

Their programmable nature makes it easier to reconfigure systems – adding new terminals, more lines, devices with different characteristics. And the front-end processor can act as a backup to the host computer, increasing system reliability.

Programmable communications processors run a gamut of cost and power. The biggest are full-scale computers, such as 360/30s front-ending 360/50s. The smallest are hardwired controllers, with little flexibility, such as IBM's 270X line concentrators, which are not programmable.

Minicomputers, though, have taken over the middle ground, both in terms of price and of power. Some manufacturers have used microprogramming techniques to adapt minis to front-end processing, and many systems are available both from mini makers and systems houses.

Message Switching

A message-switching system is basically a method for controlling communications between several terminals and CPUs. In a teleprocessing hookup using remote concentrators or front-end processors, a terminal can talk only to a computer.

In a message-switching system, a terminal can talk directly to another terminal by going through the message switcher. The message switcher becomes the central exchange in a fully interconnected communications network.

The box itself performs many of the functions of a front end, including error checking and correcting, code conversion, polling and addressing and temporary storage.

In addition, it constantly monitors traffic on the telephone lines, directing messages through the most efficient and least costly route. It can compensate for lines going down, and regulate traffic flow throughout the system.

In a message-switching environment, a terminal can address several other terminals, and send the message once – to the message switcher. The switcher then relays it to the addressees, rather than forcing the originating terminal to transmit to each terminal – another way of saving on line charges.

For some time message switch-

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Vendors Banking on Mini's Flexibility

One of the most important beachheads minicomputers have made in data communications is the replacement of IBM's hard-wired 270X line concentrator units.

Minimakers were able to offer two advantages to induce users to replace their IBM units. First, by using a mini, they were able to present a plug-compatible replacement at less than IBM prices, and, second, they were able to take some of the control burden off the CPU by using the programmable computation power of the mini.

The IBM 3705 programmable front-end processor performs line control, character checking, line polling and buffering tasks for asynchronous and BSC communications. At prices ranging from $57,000 to $449,000, it replaces the top-of-the-line 2703, in some cases with a price advantage.

The 3705 is a threat to the mini vendors, especially since almost 40% of 155 and 165 users is planning to acquire the unit, according to *EDP/Industry Report.* Over half of the large-system users either plan to get, or are now considering the 3705.

There are limitations to the 3705 that give the independents room for sales arguments, though. It is designed for IBM systems, and cannot handle terminals from other manufacturers using different codes and line disciplines. It cannot handle a 300 bit/sec terminal, for example, except on an RPQ basis, because IBM simply doesn't sell a 300 bit/sec terminal, according to Phil Cleveland of Tempo Computers.

The new front-end processor cannot support polling techniques for CRTs, special display cursor controls for graphics applications and asymmetrical data rates, Cleveland added.

Nor can the 3705 operate peripheral gear such as disks or printers, necessary for message switching and store-and-forward applications.

Mini Advantage

The flexibility of the mini allows it to be programmed to accomplish all these functions. Special situations, such as handling terminals of diverse character can be accommodated easily with the mini.

A system designed by Scidata around a PDP-11, for example, maintains an internal table of terminal characteristics, such as speed, priority, appropriate data set, operating characteristics and optimum communications route. (The system handles communications between 36 remote plants and the user's headquarters in Chicago.)

Adding lines, changing terminals or changing system configuration can be done easily by changing the device characteristics tables, according to Al Shohfi of Scidata. In addition, the system has a mag tape drive, so that it can operate off-line from the main computer. It also drives a CRT terminal at company headquarters for monitoring communications activities.

The minimakers have said that the 3705 gives IBM's blessing to the concept of programmable front ends. What they hope to do now is compete with IBM by offering greater power and flexibility.

Mini's Role in Communications a Cost Saver

(Continued from Page S/14)

ing was done only by very large and expensive processors – Univac 1108s, for example. This was so because the message switcher had to handle several peripherals – primarily a large amount of disk storage for message storing and line printers and mag tapes for system logging and output.

Minicomputers, though, are beginning to take over many functions from the expensive mainframes. Peripherals are now available for minis that weren't on the market only two years ago, and the processing power of minicomputers has increased to the point that they can handle message-switching functions in systems of several processors and several hundred terminals.

Minis have also brought processing power to the other end of the data communications system – the terminals.

The variety of intelligent terminals is great; remote batch terminals, data entry terminal systems, graphic CRT systems, programmable buffered terminals . . . all use local processing power to reduce line costs and alleviate CPU overhead.

Minis have penetrated this market most deeply with remote batch terminals. They handle I/O peripherals such as card readers and line printers for high-speed data communications with a remote CPU. They perform editing and checking functions, and perform code and transmission discipline conversions required by different CPUs.

In data entry systems such as Four Phase's IV/70, a mini acts as a controller for a number of key entry stations, and then compresses the entered data and converts it into a form suitable for transmission.

Users become interested in new products when they come on the market; manufacturers offer new products when they see a market demand. The minicomputer has helped break this closed circle by offering a cheap and flexible component around which to design systems.

One of the main advantages of the mini to a data communications user is its flexibility and programmability.

Once installed in a system, it can adapt to new CPUs, new terminals, new system organization – it won't be quickly outmoded.

Similarly, manufacturers have found the mini an ideal base for building new systems. The mini's chameleon nature is one reason for the data communications products boom in the last two years.

Perhaps while taking advantage of user interest in teleprocessing systems, the mini industry has helped create that interest.

Minicomputer Users — **LIBERATE** Yourselves From Software Development Problems!

If your software projects overrun their budgets . . .

If you cannot meet software production schedules . . .

If you lose time and money when hardware delivery is late . . .

If you frantically debug through the console display lights . . .

If you have no way to debug all of your software routines, then you need MIMIC.

- MIMIC is software work starting even if hardware delivery is late. Programmers do not wait in line to use the minicomputer, and battles between hardware and software people are eliminated.

  MIMIC has all the software preparation tools—text editors, assemblers, loaders and a powerful debugging package. It runs on a timeshared computer so all programmers can work simultaneously—at their own speeds, during the day or night. A virtual machine matching the actual minicomputer hardware may be built to "run" with the debugging package. With MIMIC new software is not tried on the minicomputer until it is fully debugged on a simulated machine which always works correctly.

- MIMIC is always having a debugging package available so that all error paths and code that processes real time events may be debugged.

  MIMIC's debugging package takes no user core. If the user builds a virtual machine with 8K words of memory, all of that can be used by his program. Debugging aids do not disappear when the last few bugs in an 8K program must be found! MIMIC provides six different breakpoints for stopping execution under a wide variety of conditions. These breakpoints may be set on any location in memory. Execution may even be done on an instruction-by-instruction basis if the programmer needs time to think and watch critical operations. Machine states—core memory, hardware registers, I/O device status—may be saved at any time and restored later as if no interruption had occurred. Thus, time-consuming setup need not be repeated for every debugging session.

- MIMIC is updating software without disabling an entire production system.

  Enhancements may be made to the source programs and debugged thoroughly with MIMIC. Then the new executable code is transferred to the minicomputer. Using MIMIC means that an entire production system need not be disabled for lengthy periods of time in order to make one component—the minicomputer—available for software work.

- MIMIC is buying only the hardware needed for your production system.

  Minicomputers are ideal for running software but not for developing software. To overcome this limitation, users buy more core and more peripherals to use when software is being built. When the minicomputer becomes part of the production system, this extra hardware just gathers dust.

- MIMIC is being able to make honest and accurate project and budget plans—and sticking to them.

  MIMIC's tools are uniform and consistent; they work the same day after day. The programmers know what tools are always available for accomplishing their tasks. Now they can make realistic time and money estimates, and project managers can accurately determine and control the costs of building software. With the help of MIMIC, you will be assured that new hardware can be purchased for future systems now in the planning stage.

The Control Systems Division of Applied Data Research, Inc., has created MIMIC—a DECsystem-10 based system that provides program development tools for minicomputer assembly language programmers. We have used it for two years in our own minicomputer systems work. Minicomputer manufacturers have also used it with great success. These experiences have convinced us that MIMIC can help many minicomputer programmers make tremendous improvements in the quality of their software. All aspects of software development may be done under MIMIC. Compatibility with the specifications of the minicomputer manufacturers is maintained every step of the way. This means no costly program conversion is needed when debugged programs are transferred from MIMIC to the actual minicomputer for final testing and running.

Minicomputers now supported by the system are:

- Digital Equipment Corporation's PDP-8, -8/I, -8/L, -8/E, -11/10, -11/15, -11/20, -15
- Data General Corporation's NOVA, NOVA 800, 820, 1200, 1210, 1220, SUPERNOVA, SUPERNOVA SC
- GRI Computer Corporation's GRI-909, -99

MIMIC is available on a number of DECsystem-10 computers operated by timesharing utilities throughout the United States and Canada. These include:

- Dataline Systems, Ltd., Toronto, Ontario (416) 964-9515
- First Data Corp., Waltham, Mass., (617) 890-6701
- On-Line Systems, Inc., Pittsburgh, Pa., (412) 931-7600
- Tymshare, Inc., Cupertino, Calif., (408) 257-6550

Private institutions supporting a DECsystem-10 may obtain MIMIC for a monthly license fee.

CONTROL SYSTEMS DIVISION
APPLIED DATA RESEARCH, INC.
(609) 921-8550

For additional information contact:

MIMIC Product Manager
Applied Data Research, Inc.
Route 206 Center
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I am interested in ☐ PDP-8 ☐ PDP-8/E ☐ PDP-11 ☐ PDP-15
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Bits & Pieces

NCR Cuts Purchase Price On 50s, 100s by $7,000

DAYTON, Ohio – NCR has cut the purchase prices of each of its Century 50 and 100 systems by $7,000. The lease/purchase ratio on installed systems is also improved, the company said.

A "typical" Century 50 with basic peripherals was priced at $95,000 and will now cost $88,000, a decrease of 7.4%. The Century 100, previously at $112,000, now costs $105,000, a decrease of 6.2%.

For lease/purchase users with existing contracts, the "net rental conversion price must be at least 55% of the current published equipment list price," a spokesman said.

Basically, the move amounts to a reduction for both purchase and lease/purchase customers, he added. Users with equipment on straight rental plans are not affected.

MAC 16 Adds Potter Printer

LOS ANGELES – Lockheed Electronics Co. Inc. has added medium-speed line printing to the MAC 16 minicomputer with the Potter LP 3000 line printer and controller. The printer features 135 line/min, 132 columns, hardware buffering, and multiple copy printing. The Model 24-355 Controller is fully software supported and will operate with the MAC 16 real-time executive and background executive.

The printer and controller with complete software is priced at $6,200. Availability is 45 days from the Data Products Division, at 6201 East Randolph St., 90040.

Coupler Aids Phototypesetting

BLADENSBURG, Md. – The Digi-Data Corp. Model 3500 Coupler provides for magnetic tape input to standard phototypesetting equipment. Computer output data can be processed directly, with no conversion required.

IBM-compatible 1/2-in. magnetic tape on 7-, 8-1/2- or 10-1/2 in. reels is utilized. Maximum flexibility and ease of interfacing are assured by a built-in buffer memory, allowing for variations in data transfer rates, the firm said. A code conversion feature, provides the ability to accept 7- or 9-track tape in any format, and convert to any other output code.

Features of the 3500 include search, which selects the number of files, records or characters to advance the tape before processing begins; job length select which allows for unattended operation; and a display to indicate which file, record or character is currently in process.

The tape transport, logic and control panel are housed in a single enclosure. Prices start at $7,500. Digi-Data is at 4315 Baltimore Ave., 20710.

$2,000 Savings per 8K

Fabritek Offers Add-Ons for HP Minis

By a CW Staff Writer

MINNEAPOLIS – Fabritek Inc. has an add-on core memory system for the Hewlett-Packard 2100A, 2114A and 2114B minicomputers.

The memory systems are plug-compatible with the HP minis and have their own power supplies within a separate unit, a spokesman said. To install a Fabritek memory, an HP board is removed from the mini and a replacement board, connected to the add-on box, is plugged in, he said.

On the 2114 minis, the Fabritek memory allows the user to increase his system to 32K words. The maximum memory offered by HP for these models is 8K.

The add-on (or replacement) memory system is priced "about $2,000 [less] per 8K word increments" than the HP memories, Fabritek said.

The system will be available on a sale-only basis and service will be provided on an on-call basis by the Fabritek OEM field service division, the company said. The user thus pays on an hourly basis rather than have a regular monthly maintenance charge, a spokesman said.

Asked whether the Fabritek add-on units would have any effect on existing HP maintenance contracts, an HP spokesman said the company was looking into the matter.

Although many of the affected minis are on lease plans, presumably with maintenance, a Fabritek spokesman said the add-on units are functionally transparent and would have no adverse impact on the operation of the minicomputers.

The Fabritek memories can be ordered in 8K increments and each enclosure can hold a maximum of 32K words. Installations of the memory system have already been made and deliveries are being scheduled six weeks from receipt of order, a spokesman said. Fabritek is at 5901 South County Road, 55436.

2 Minis Get Add-Ons

NEWTON, Mass. – Cambridge Memories Inc. has introduced add-on memory configurations for the PDP-11 and Varian 620 minicomputers.

Called Minicage and Verticage, the memories are said to be 20% to 40% below the core expansion prices of the mini suppliers. The Minicage package stores up to 24K 16-bit words and the Verticage can hold 64K 16-bit words. Both units are plug-compatible with the minis and include internal power supplies.

The add-on memory configurations are available in 8K increments and operate at 750 nsec, a CMI spokesman said. The systems will be offered on a sale-only basis and maintenance will be available for the memories on an hourly charge as required.

The two configurations use Expandacore-11 and Expandacore 620 memories and are compatible with all PDP-11 models and the Varian 620-i and -l, CMI said. The systems are available in 60 days from the company at 285 Newtonville Ave., 02160.

Coupler Connects Card Readers CRT Terminals, Minis and TTYs

NEWPORT BEACH, Calif. – True Data Corp. has a coupler to interface the firm's card readers to "most standard" peripheral and data communications devices plus a "broad range" of computers. Called the Data Link, the device can also be used with card readers not supplied by True Data, a spokesman said.

The Data Link is designed for devices that can accept an 8-bit-parallel byte including CRTs; Model 33 through 38 TTYs; synchronous and asynchronous modems operating at 110 to 9,600 bit/sec; and minicomputers.

When connected to a CRT, the Data Link allows the contents on the input card to be displayed on the screen, a spokesman said. Similarly, the contents of a card can be entered into CPU memory, printed on a TTY and transmitted via a modem.

Can Be Adapted

While the Data Link is primarily designed to operate with the True Data Model 600 and Model 1000 card readers, a few changes in the connector pins can adapt the unit to card equipment from other suppliers, a spokesman said. Some additional engineering support may be required for certain card equipment, depending on the signaling requirements, he said.

For the user, the Data Link effectively connects a card reader as an input device to a variety of data storage devices including mag tape recorders, paper tape punches and I/O terminals. The coupler can interface with minis such as the DEC PDP-8, and other systems with a parallel I/O port.

In addition, the Data Link can interface with incremental tape recorders handling either Ascii or Ebcdic codes, and with the Wang 700 programmable calculator.

The Data Link with a True Data card reader costs $2,995. The coupler alone is priced at $1,695. True Data is at 550 Newport Center Drive, 92660.

Philips Adds 'Mosaic' Printer

NEW YORK – Philips Business Systems Inc. has unwrapped a mosaic line printer for its P-350 Series of office computers.

Designated the P-150, the mosaic printer can produce from 60 to 150 line/min of up to 128 char./line. The workload is divided between two mosaic heads that have a 9 by 11 dot format.

The mosaic line printer, compatible with five of the six models in the P-350 Series, can extract one type of report from a program while the computer console printer is producing separate information. Also, the two mosaic printer heads have separate buffers which enable them to perform two independent readouts simultaneously.

At maximum capacity the P-150 will print six times the number of lines per minutes as the console.

The mosaic line printer has a low noise level, and each printing head forms alphanumeric and special characters from 99 needles that flick against ribbon and paper with low impact. The P-150 will handle continuous forms in widths from 2-3/4 in. to 17-1/4 in.

Available for September delivery, the Philips P-150 line printer leases for as low as $175/mo. Philips is at 100 E. 42nd St.

Interdata Cuts Mini Costs

OCEANPORT, N.J. – Interdata Inc. has reduced the cost of a typical 24K minicomputer system by about 10%.

A 24K New Series Model 70 system will be available for $39,350, compared with the old price of $43,400. Interdata is at 2 Crescent Place, 07757.

Reader Added to S3/10

WHITE PLAINS, N.Y. – IBM has added an optical mark reading capability to the System 3/10.

The 3883 Optical Mark Reader, previously announced for on-line use with the 370/135 and 145, and off-line use with the 3410 magnetic tape system, will also be available for S3/10 disk systems with a minimum of 12K bytes of core.

The 3881 Model 1 for on-line use can handle documents from 3 in. by 3 in. up to 9 in. by 11 in. pages. It can read 4,000 standard size 8.5-in. by 11 in. page/hr.

The Model 1 for the 3/10 will cost $1,351/mo rental, $56,000 purchase and $1,150/mo on the 24-mo. extended-term plan. The 3881 is scheduled for first deliveries in the second quarter of 1973.

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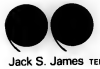

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IBM SYSTEM TYPE	TELEX SYSTEM TYPE	IBM* RENTAL	352 HRS. OVERTIME	TOTAL IBM MONTHLY RENT	TOTAL** TELEX MONTHLY RENT	TELEX MONTHLY SAVINGS	TELEX ANNUAL SAVINGS	% SAVINGS
370-135 3135 GF with 6-3420-5 tapes, 6-3330 disk and 2-1403N1 printers and appropriate controllers or adapters	370-135 3135 GF with 6-6420-5 tapes, 6-6318 disks, 2-5403 printers and appropriate controllers	$ 20,551	1,686	$ 22,237	$ 16,369	$ 5,868	$ 70,416	26%
370-145 3145 I with 8-3420-5 tapes, 8-3330 disks, 2-1403N1 printers and appropriate controllers or adapters and memory	370-145 3145 I with 256K Telex memory, 6-6420-5 tapes, 6-6316 disks, 2-5403 printers and appropriate controllers	34,334	4,318	38,652	26,846	11,806	141,672	31%
370-158 3158 J with 16-3420-5 tapes, 24-3330 disks, 2-1403N1 printers and appropriate controllers and adapters and memory	370-155 3155 J with Telex memory, 16-6420-5 tapes, 24-6316 disks, 2-5403 printers and appropriate controllers	84,942	7,270	72,212	50,492	21,720	260,640	30%
370-168 3168 K with 16-3420-5 tapes, 24-3330 disks, 2-1403N1 printers and appropriate controllers, adapters and memory	370-165 3165 K with Telex memory, 16-6420-5 tapes, 24-6316 disks, 2-5403 printers and appropriate controllers	106,862	16,016	124,700	92,278	32,422	389,064	26%

*Includes IBM's Fixed Term Rental Plan, Extended Term Plan, as well as the use of the newly announced price modifications—Integrated Storage Control, Integrated File Adapter, the 3830-2, the 3333

**Both the Telex and IBM prices include Virtual Storage and Dynamic Address Translation (DAT)

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COMPUTER INDUSTRY

CI Notes

IBM Files Summary Motion

ST. PAUL, Minn. – The Federal Court hearing the case of Telex against IBM here will have a new item on its agenda when it meets Sept. 11.

IBM has filed a motion for summary judgment in the case, which, if granted, would result in a dismissal of the Telex suit. The hearing on Sept. 11 was originally set to hear arguments presented by Telex for a preliminary injunction to prohibit certain IBM sales practices and to force IBM to stop marketing its recently announced virtual storage computer systems.

Calcomp Lands Univac Work

ANAHEIM, Calif. – The long-rumored deal between Calcomp and Univac for disk drives has been confirmed.

Under the $5 million deal, Calcomp will supply 8440 disk drives to Univac this fiscal year. Univac will make its own controllers for the systems, the firms said.

GE Plans Control System

BLOOMINGTON, Ill. – General Electric will introduce a new programmable controller at the International Machine Tool Show in Chicago Sept. 5-15.

The Logitrol unit can handle over 2,000 inputs and outputs, the firm indicated. Memory assemblies for the mini-based unit come in either 1K, 2K or 4K capacities, GE added.

Supershorts

Scan-Data Corp. has signed an agreement for sales to Alanthus Peripherals, Inc., a New York-based leasing company, of up to $4 million of leased optical character recognition systems during the 12-month period ending June 12, 1973.

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A Computer Software and Services Group has been formed within WEMA.

– – –

Sangamo Electric Co. and United Business Communications, Inc., have announced their intent to combine their respective data modem operations through a new joint venture corporation in Silver Spring, Md. The new company will be operated as a subsidiary of Sangamo Electric Co. which will own 60% of the company. United will own 40%.

– – –

The General Services Administration has included Bunker Ramo's BR-700 information system in its authorized federal supply schedule.

– – –

Itel Corp. has completed arrangements for a one-year, $1.3 million revolving line of credit from Franklin National Bank for its Data Processing Division.

Adapso '71 Survey

74% of Service Bureaus Profitable

By E. Drake Lundell Jr.
of the CW Staff

NEW YORK – The computer services industry is looking better with improved profits reported by 74% of the firms recently surveyed in the Association of Data Processing Service Organization's (Adapso) 6th annual survey of the industry.

"Computer services industry revenues for 1971 were nearly $2.4 billion, up 24% over 1970," according to J.L. Dreyer, Adapso executive vice-president.

The firms in the business, he added, showed a 5.6% pretax profit, "which significantly reversed the minus 8.3% pretax figure for 1970."

According to the survey, prepared by International Data Corp. for the association, the batch processing sector represented the largest portion (45%) of revenues in the business, but batch processing revenues declined from 76% in 1966.

At the same time, on-line processing, which accounted for only 4% in 1966, accounted for 19% of the revenues in the business during 1971.

The software portion of the revenues in the service bureau industry remains steady at 9% of the total revenues, with other services such as keypunching, OCR, COM and facilities management now contributing about 17% of total revenues in the industry.

To be profitable in the business at present a firm should stick closely to basic batch processing, the study indicated, although this might not remain true in the future.

Profitability was reported by 83% of the general batch processing firms, the report stated, compared with only 45% of their more venturesome brothers in on-line processing, facilities management and packaged software.

IBM increased its share of the service bureau market substantially during 1971, according to the survey.

In 1970, it supplied equipment to 33% of the service bureaus, followed by Digital Equipment with 10% and Honeywell with 8%. In 1971, IBM installations accounted for 49% of the bureaus surveyed, Burroughs for 13% and Honeywell for 11% of those covered.

In addition, there appears to be a slight change from keypunch to key-to-disk equipment among the operators of service companies. In 1970, 60% had keypunch equipment, and 50% in 1971.

Key-to-tape/disk users increased from 8% in 1970 to 16% in 1971, while users of terminals increased from 20% to 34% in the same time period. However, the number of OCR users dropped from 6% in 1970 to 3% in 1971.

Most customers of service bureaus spend less than $5,000 per year on services, the study found, indicating that 59% spend under that figure, but that the average revenue per customer was $5,092.

Customer Base

The customer base of the service companies is shifting also, the report indicated. In 1970, manufacturing companies accounted for 43% of the customers, but this dropped to 26% in 1971.

At the same time, the wholesale/retail industry picked up the slack, accounting for 41% of the customers in 1971, compared to 29% in 1970. Most other areas remained static, except the government customer, which accounted for 6% of the customers in 1970 and only 3% in 1971.

In the future, the report predicted that both the number of firms in the services section and the revenues in the business would increase rapidly.

Growth by 1975

There were approximately 1,500 firms in the business in 1971, the report stated, predicting that the number would grow to around 2,200 by 1975. At the same time the total industry revenues are expected to increase from $2.35 billion to $4.68 billion.

The average revenue per firm in the business was $1.57 million in 1971 and this figure should increase to $2.13 million by 1975, the study projected.

Revenues from batch processing operations amounted to $1.06 million or 49% of the total revenues in 1971, but should reach $1.79 million in 1975, when batch processing will account for 38% of the total revenues in the business.

On-line services accounted for 19% of the revenues in 1971 ($440,000), but will increase to 31% or $1.44 million by 1975.

Software will decline as a percentage of total service revenues from the 19% registered this year to 14% in 1975, the study added, while revenues from other services will remain about the same as a percentage of total revenues.

IBM Picks Three Security Sites

ARMONK, N.Y. – IBM has disclosed the names of the three non-IBM sites it has selected to participate in its planned $40 million study of computer systems and data security.

The five-year plan was announced by T. Vincent Learson, IBM chairman, in the keynote speech at the Spring Joint Computer Conference in Atlantic City, N.J., this past May.

MIT, Cambridge, Mass., was selected as the university partner in the project; the State of Illinois will represent the governmental sector; and TRW Systems was named the business representative. IBM's Federal Systems Division in Gaithersburg, Md., will coordinate the research project.

Systems Programming

The Federal Systems Division will reportedly also provide much of the systems programming for the project, while the MIT researchers will devote their attention to hardware safeguards and to limiting access to systems from remote locations.

The group in Illinois will examine the overall economics of data security, with emphasis on determining the cost of various levels of security protection – a cost that will have to be borne by future users.

The TRW group will attempt to define systems security and develop techniques for measuring the security of computer systems at all levels.

While IBM is backing the project with both funds and personnel, Learson said in his keynote speech that the results of the study would be made available to everyone in the computer industry and that none of the results would be proprietary to IBM.

In announcing the project, Learson said the user installations would be used to build a sound body of knowledge and develop some hands-on experience" with the new security capabilities.

In the past, he stated, manufacturers have not developed better safeguards because there had been "little market demand" for such systems. IBM, he said, is trying to anticipate the demand for data security before it became "immediate."

RCA/Univac and NCR Show Rental Changes In Railroad Industry

WASHINGTON, D.C. – Although the number of computers installed by the railway industry last year rose only to 253 from 250, RCA/Univac and NCR showed significant changes in percentage of rental value for the industry, according to figures published by the Association of American Railroads.

Between 1971 and 1972, Univac/RCA's portion of industry rental declined 18.8%, while NCR's grew 166.7%.

In 1971 with Univac/RCA listed as combined, the rental value of the total market was 7.4%, whereas 1971 listings indicate RCA had 6.5% and Univac 3.7%.

NCR's rental value grew from .2% of the industry total to .5% within the last year.

IBM continued to hold the lion's share, with 84% of the rental value in 1971 and 84.7% in 1972.

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Three Shows in Three Months

Coast Exhibitors Have Busy Schedule

SAN FRANCISCO – The proliferation of computer industry trade shows on the West Coast this fall is causing some concern among potential exhibitors.

There will be three shows here in as many months this year led off by Wescon (Sept. 19-21), the new Nedpac show (Nov. 7-9) and the last Joint Computer Conference (Dec. 5-7). They will be held in San Francisco, Los Angeles and Anaheim, respectively.

An Unknown

"The Nedpac show has thrown an unknown into the equation," one exhibitor said. "They seem to be aiming to be all things to all people, whereas the joints and Wescon are known quantities."

The joints, he noted, have been known as end-user shows, or higher-level OEM shows where firms show complete systems, while Wescon aims more at engineers showing components and OEM computer equipment primarily.

"Nedpac said that it would try to be both, but I don't see how they can do it," he said.

Depressed State

"With the depressed state of the shows in the past few years I think the new show will hurt by taking away potential exhibitors from the other shows," a show manager for a mini maker said.

"Either that or they won't get enough exhibitors to open and will be forced to close," he added.

The two established shows may be more worried about competing with each other for attendance and exhibits than with the new upstart.

California Competition

"After all they are going to be in the middle and will serve northern California," one source said referring to Nedpac, "while we will be only two months apart and will be both trying to draw attendance from the southern California area."

But neither of the established meetings seems to be hurt by the competition in terms of exhibitors.

Officials of both Wescon and the Joint have reported that booth reservations are running ahead of last year at this point, with Wescon projecting a 10% to 20% rise in the number of exhibits when the show opens and the Joint projecting an increase also.

Contracts

Sycor, Inc. has received a multimillion dollar contract for delivery of 500 pre-programmed Model 340 intelligent terminals to Business Communications Sciences, Inc. (BCS).

The terminals are being installed in automobile dealerships associated with the BCS affiliate, Computerized Automotive Reporting Service, Inc. (Cars).

A joint venture headed by Computer Sciences Corp. has been selected by the National Aeronautics and Space Administration to provide on-site DP services at Goddard Space Flight Center, Greenbelt, Md.

The award is valued at about $21 million over three years. CSC will have overall management responsibility for the project and will provide 75% of the contract services, along with Technicolor Graphics and DP Associates.

Logicon, Inc. has received two contracts totaling $450,000 from Controlmation, Inc. for design of mail sorting systems at the New York and Chicago Bulk Mail Centers.

The Autonetics Division of North American Rockwell Corp. has been selected by Nasa to provide three Model D-216 computers and support to identify possible space shuttle flight control problems.

Conrac Corp. has received a $1.8 million contract from Galeao International Airport in Rio de Janeiro for an airport information system.

Infodata Systems Inc. has received contracts from Avco Broadcasting for installation of its BCS Titan System at television stations in Columbus and Dayton, Ohio.

English Market Caravan
Sept. 4 - Oct. 18, 1973
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Market Rose 30% in Year

SEL Expands Sights to Utilities

NEW YORK – In order to meet the desired future growth levels, Systems Engineering Laboratories is concentrating on the power utility marketplace in addition to its traditional marketing efforts.

In a recent speech to the Computer Industry Analysts Group here, President C.E. Griffin said that market was chosen because it was "large enough so that a small piece of it could be very significant to us."

Other factors considered in making the decision, he said, were that Systems already had some success there; utilities are purchase oriented and industrial oriented.

In addition, it is a relatively stable market growing in an orderly fashion, he said. The power utility market requires real-time systems capability, and Systems would only need to make a minimum investment to penetrate it, he said.

He said the utility market, particularly the power industry, will spend about $10 billion a year in general equipment and that in 1971 utility spending for computers and instrumentation reached $500 million, an increase of 30% from the year before.

The market for computer equipment to the utilities will continue to grow at a rate of between 20% and 30% over the next few years, he predicted.

"We expect to sell to generation equipment suppliers (primarily in the nuclear reactor area) that do not have their own computers and in some instances are presently buying from their competition," he said.

"We also expect to sell to major suppliers of computer and instrumentation utility systems, and to a lesser degree, to sell direct to utilities."

'Testing Decision'

At the same time, he noted the firm "did not receive new orders from this market" during its 1972 fiscal year, but added "The eight months since our decision have been spent learning the industry, developing potential customers, and, in general, testing our decision.

"I am more convinced today than ever that it was a good decision," he stated.

He also explained that "our utility market decision is not a 'put all your eggs in one basket' type decision. We can achieve the goals we have established for this fiscal year without any significant penetration of the utility market.

"We fully intend to pursue vigorously our traditional markets which will form the foundation of our growth and look to success in the utility market as the catalyst that greatly accelerates that growth rate."

In addition, the firm's development plans for the coming year are "geared to programs that will extend and enhance the life and range of our two computer families; continue development on our next generation computer, and support our utility market program," Griffin said.

CSC Won't Know If Its OTB Is Profitable Until 1974

Special to Computerworld

LOS ANGELES – Computer Sciences Corp. (CSC) is finally off and running with its automated Off-Track Betting system in New York City, but it won't know whether it is in the winner's circle for some time yet.

The system, which was experiencing some interruptions a year ago, is now performing well and handling about 300,000 bets a day, it was reported at the company's annual meeting.

But the profitability of the system won't be known until the end of June 1974, when the contract with the city's Off-Track Betting Corp. ends, since the profitability is tied to bet totals.

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French DP Industry Wary of IBM Offensive to Grab USSR Market

By Bohdan O. Szuprowicz
Special to Computerworld

PARIS – The French computer industry is watching with great interest, if not alarm, what it calls "the preparations for an American offensive to conquer the Soviet computer market."

At the IBM Europe headquarters here a new director of operations for Eastern Europe, R.L. Degnan, has been installed and the marketing is reportedly being strengthened by the addition of several Russian-speaking computer engineers.

Until recently, East European operations of IBM were directed from Vienna, Austria, where 300 full-time personnel are ready for sales, training and support work in the Soviet Union as well as all other East European countries.

Last fall the former director of the East European Region, Ralph Stafford, returned from Vienna to IBM World Trade headquarters in New York only to resign his post this month to become the president of Satra Industrial Corp., a marketing and trade representative organization specializing in business with the Soviet Union.

Satra Corp., the parent of the newly formed Satra Industrial Corp., was representing IBM in the Soviet Union and is expected to continue in this function.

Observers in Europe feel that if a major deal between IBM and the USSR ensues, an IBM office in Moscow will soon follow.

French Suspicions

Meanwhile, the French suspect IBM is coordinating plans to sell several hundred of its machines to the Soviet Union, including some IBM 360/50 models, one of which was sold last October.

The French weekly magazine *L'Express* believes the Soviet purchases of $700 million worth of American wheat were but a prelude to other deals, including some involving high technology items.

Computer industry observers in Paris believe that IBM's competitive strength in the Soviet Union, vis-a-vis other Western firms, is its ability to offer a complete package deal consisting of a large number of readily available computers as well as all the software and automation know-how.

Only a great supply of proven computers can appeal to the Soviets who are intent on automation of their industries within the current Five-Year Plan (1971-75) to meet national production goals – but find themselves restricted because their own computer production is inadequate.

Only IBM

In effect, only IBM can rapidly supply several hundred 360 systems which happen to be program compatible with the Soviet third-generation Riad machines now under development.

The French feel IBM was ruthless in its first proposal to the Soviets which amounted to an offer to sell Moscow all 360s recently traded in by IBM's Western clients for IBM 370 models.

But, said *L'Express* is apparently was only a tactical move, and the French feel IBM will sign a major contract with the Soviets before the end of summer.

For their part, the French are counting on the CII-Siemens agreements to impress the Soviets further, particularly because they propose to have common products by 1975.

While the Soviets are most fascinated by U.S. computer technology, they also highly regard German dedication and hard work. Thus the French hope to benefit in the long run from their deal with Siemens in combatting the "American Challenge."

But the French expect a lot more "hard sell" ahead before they can carve out a respectable slice of the Soviet computer pie.

Foreign Orders & Installations

The Eastern Electricity Board, Ispwich, England, has taken delivery of the first Honeywell Series 6000 system in the UK. The Model 6060 will be used to develop an integrated information system, and will have a terminal network linking four group offices, 19 district offices and some of the utility's 130 shops.

A Burroughs B6700 dual-processor system has been installed at the British Home Office as the first phase of Britain's Police National Computer Program. The B6700 will be the center of a nationwide data communications network

General Computer Systems, Inc. has received orders totaling $1.6 million for its System 2100 key-to-disk units from the British Customs and Excise agency, Royal Arsenal Cooperative Society and Moscow Narodny Bank.

Micrographix Ltd., a South African computer output microfilm service center, has purchased a second 4440 COM system from Stromberg Datagraphix, Inc.

Eindhoven University of Technology, Holland, has ordered a Burroughs B6700 dual-processor system valued at $3 million. The system will be used for student and administrative work, and will also manage the data base for remote special-purpose computers.

DBS Chartered On-Line Ltd., a Singapore service bureau, has ordered a Univac 1106 system.

The Belgian Ministry of Finance has installed an NCR Century 200 system to supplement two NCR 315s for computing property, income and auto taxes.

A 300-terminal Credit-Check system from Credit Systems, Inc. has been installed at El Corte Ingles department stores in Spain.

Kybe Corp. has shipped CS-1600 Certifiers to Agfa Gevaert AG for use in its tape manufacturing facility in West Germany.

Scientists Catch Up With Dying Stars

SOCORRO, N.M. – Stars that exploded millions of years ago are being studied "live" here with a computer.

Stirling Colgate and Elliott Moore, scientists at New Mexico Institute of Mining and Technology, study dying stars – called supernovae – so rare and distant that only about 300 have been seen in the entire history of astronomy.

To increase greatly the possibility of finding these objects, an IBM 360/44 and a ground-based optical telescope have been combined to make fully automated, high-speed astronomical observations.

The stars studied actually exploded eons ago and quadrillions of miles away, but the light only now is reaching Earth. A small fraction of all stars pass through the supernova stage, and astronomers have observed very few in the most revealing early hours of disintegration. To acquire a reliable amount of data, Colgate and Moore must explore thousands of galaxies at an extremely rapid rate.

Controlled by the computer, the telescope is designed to point briefly at each of 4,000 galaxies during a four-hour period. A sensing device similar to a TV camera records intensities of light within each galaxy and transmits the information in numerical form to the computer for interpretation.

During another four-hour period the same night, the telescope returns to each galaxy. If light intensities have changed since the last scan, the instrument is programmed to zero in on that part of the galaxy.

"Increased intensity, automatically detected by the computer, indicates that a star is exploding," Colgate said.

The light emitted by a star as it explodes is converted into electrical impulses and transmitted to the computer. The light can be broken down into its color components and the computer can report what elements are being formed and how much of the star's energy is being released as cosmic rays.

French Map Making May Equalize Taxes

AIX-EN-PROVENCE, France – A 10-year program to digitize all of this country's cartographic information will begin here this fall. Several minicomputers will take data from aerial photographs and surveying instruments, process it, and transfer it to large data banks in digital form.

Updating Flexibility

Inexpensive updating flexibility and the levying of fairer taxes are primary reasons cited for France's move to computerized digitization. According to Jacques de Montremy, director of the SFOM Optics Division of S.A. Engins Matra, a large French industrial complex, "Digitizations will give cartographers the ability to make changes quickly and easily.

"New towns grow and change all the time, and under the present system once a map is drawn and printed changing it is a costly business. A data bank allows modification with little or no difficulty."

Equitable Taxation

"By the same token," says de Montremy, "taxation based on existing maps is inaccurate since these maps were often collated commune by commune and village by village. The data bank will be a step toward more equitable taxation, and it will help other government departments, too, when they need mapping information for different purposes."

The PDP-8/E minis, manufactured by Digital Equipment Internationale and used for the French program, are incorporated into photogrammetric digital plotting systems manufactured by the SFOM Optics Divison. In all, five to 10 minicomputer systems will supply digitized information to each of two or three large data banks for storage and updating.

Aussies Turn To Town Planning

Special to Computerworld

MELBOURNE, Australia – Computer programs that print two-dimensional maps and three-dimensional perapective views as accurately and creatively as any artist will be used in a feasibility study for a satellite town near Melbourne.

The satellite town is Sunbury, with a population of 6,000 – under the plan it would have more than 100,000 inhabitants. The computer programs used in conjunction with a computer can sketch a "birds eye" view of an area virtually from any vantage point as well as draw a map, for example, showing pollution densities over respective areas of a city.

Maps Any Variable

The program, which allows the computer to map virtually any variable, was brought to Australia by Jack Dangermond and Ray Postmar of the Environmental Systems Research Institute in Redlands, Calif. in 1968 to promote research and development in computer graphics.

ICL (Melbourne) donated computer time and Dangermond and Postmar will work with ICL personnel in converting the program to the computer.

Architects and planners who will be using the new program said it has decided advantages for the accurate planning of anvironmental control exercises such as the Sunbury project.

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AMS, Cambridge Earnings Up Sharply

3 of 4 Memory Makers' Revenues Rise

Three out of four memory makers – Advanced Memory Systems, Inc., Cambridge Memories, Inc. and Fabritek Corp. – have reported improved revenues for periods ending June 30. A fourth manufacturer, Electronic Memories and Magnetics Corp., had declining revenues and earnings, although the second quarter was an improvement over the first period.

Advanced Memory Systems' third-quarter revenues rose to $3 million from $317,633 in the same 1971 period. Earnings also rose, to $206,357, or 13 cents a share, from a loss of $880,147, or $1.06 a share. This year's figures include a $98,000 tax credit.

In the nine months, AMS revenues reached $7.8 million from $1 million and earnings totaled $170,180, or 11 cents a share, compared with a loss of $1.4 million, or $1.71 a share in 1971.

The shipment rate in the third quarter, slightly reduced from that of the second quarter, resulted from a significant shift to larger add-on memory systems by users, for which production realignments were necessary, President Robert Lloyd said.

But toward the end of the quarter shipments surpassed their previous rate.

Cambridge Earnings Up

Cambridge Memories' nine months showed revenues rising to $2.6 million from $1.2 million, with earnings of $129,546, or 13 cents a share, compared with $20,068, or 2 cents a share in 1971. In the 1972 period, Cambridge had a tax credit of $64,700, compared with $4,440 a year ago.

Fabritek's first-quarter revenues rose 30% from those a year ago, to $4.3 million from $3.3 million, and the operating loss was cut to $87,391 from $359,719.

But a hefty $1.9 million special credit on the sale of Nicolet Instrument Corp. in the 1971 period enabled Fabritek to show a profit of $1.5 million or 48 cents a share, whereas in 1972 the extraordinary credit was only $67,850, and the bottom line was a loss of $19,541, or 1 cent a share for the period.

The 1971 figures were restated to reflect changes in accounting

At Electronic Memories and Magnetics, earnings were almost half those of the 1971 second quarter, but better than the preceding quarter, when the firm showed a loss of $527,000.

Earnings were $480,000, or 9 cents a share, compared with $882,000, or 16 cents a share in the 1971 period. Earlier, President Trude Taylor had projected the firm would break even in the quarter [CW, June 14].

Revenues declined slightly, to $18.5 million from $18.6 million. Special credits for the period were $738,000 in 1972 and $569,000 last year.

In the six months, EM&M's loss was $310,000, or 6 cents a share, compared with earnings of $1.7 million, or 31 cents a share. Special credits amounted to $738,000 this year and $1.1 million in 1971. The 1971 figures are restated to reflect discontinued operations.

The second-quarter results were encouraging in view of reduced shipments of core memory products as the result of a fire in the Hong Kong plant, Taylor said. Shipments of 360 add-on memories will "increase during the remainder of the year as compared with the first six months," he added.

While the Memory Products Group continued to contribute the lion's share of revenues, the percentage fell to 59% of consolidated revenues in the six months from 65% in the 1971 period.

Magnetic Products revenues rose to 28% of the total, from 24% a year ago, and Electronic Products jumped to 13% of total revenues from 11% in the six months of 1971.

Nickels & Dimes

Potter Instrument Co. has decided to pay the price "of getting into the leasing business," with its decision to write off expenses it had been deferring and amortizing for two years since the company began leasing its products.

Although Potter has not indicated the amount of the write-off, the result will be a loss of about $4 million for the year ended June 30.

$$$

After two years of losses, Advanced Computer Techniques reported a turnaround for the first quarter, based on a sales increase of about 30%.

The company earned $21,000, or 3 cents a share, on sales of about $800,000.

$$$

Dust Biter – Stockholders of peripherals manufacturer GDI have agreed to dissolve the company and liquidate its assets, as proposed by United Telecommunications, which controls the majority of GDI stock.

$$$

Bendix sold 93,763 shares it held in Control Data for $7.1 million, resulting in a special credit of $2.4 million, or 14 cents a share in the fourth quarter.

$$$

Infomax and Computer Preparations have filed proposed arrangements under Chapter IX.

STC Boosts Earnings in Two Periods

LOUISVILLE, Colo. – The turnaround scored by Storage Technology Corp. (STC) for the second quarter and half year ended June 30 seems to indicate the firm has emerged from its "manufacturing start-up mode of operations."

The profitability of 1972 operations was "heavily influenced by a good level of sales of equipment," a spokesman said, including sales to Decimus Corp. STC has continued to ship most of its products on a lease basis, he added.

Under an agreement with Decimus, STC may annually sell up to $7 million worth of equipment on lease to end users.

In the quarter, STC earned $725,000, or .22 cents a share, compared with a loss of $1.4 million, or 54 cents a share in the 1971 period. Revenues rose to $5.8 million from $213,000 last year.

The half picture was equally bright, with earnings of $932,000, or 30 cents a share, compared with a loss of $3.1 million, or $1.24 a share in the first half of 1971. Revenues reached $9.6 million, up from $263,000 a year ago.

Graham Magnetics '72 Revenues Climb 18%

GRAHAM, Texas – Graham Magnetics Inc.'s sales for fiscal year ended June 30 rose 18% to $9 million from $7.7 million and operating income reached an all-time high of $1.1 million, up from $894,367 last year.

Earnings, however, declined to $917,463, or $1.13 a share, from $986,752, or $1.47 a share last year, with the exhaustion of tax loss credits in the first half.

Before special credits, Graham earned $739,463, or 91 cents a share, compared with $469,367, or 70 cents a share in 1971.

Cogar Sets Loss At $14.5 Million

SCHUYLER, N.Y. – Cogar Corp. said it's down but not out, with a $14.5 million loss in the nine months ended June 30. The firm indicated it believes it can resume profitable operations if projections of System 4 sales "prove to be substantially correct."

Of the loss, the dissolution of the Technology Division, which made semiconductor memories, accounted for $4.2 million in operating loss and $9.8 million for write-off of the division's assets.

The loss from continuing operations was $500,000.

In the last six months, continuing operations produced shipments of $1.3 million.

In the year ended Sept. 30, 1971, Cogar lost $8.3 million on $1.2 million in revenues.

Cogar is in default under all its bank loan agreements and mortgages and under an agreement with Singer Co.

TRADE*QUOTES

Computerworld Stock Trading Summary

All statistics compiled, computed and formatted by TRADE★QUOTES, INC Cambridge, Mass 02139

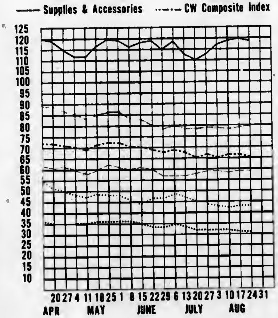
CLOSING PRICES THURSDAY, AUGUST 24, 1972

EXCH		1972 RANGE (1)	CLOSE AUG 24 1972	WEEK NET CHNGE	WEEK PCT CHNGE
	SOFTWARE & EOP SERVICES				
O	AOVANCEO COMP TECH	1- 2	2 5/8	+ 3/8	+16.6
A	APPLIED OATA RES.	4- 7	4 5/8	- 1/8	-2.6
O	APPLIEO LOGIC	1- 4	2 1/2	0	0.0
N	AUTOMATIC OATA PROC	72- 99	89	-5 1/8	-5.4
O	BRANDON APPLIEO SYST	1- 2	1 1/4	+ 1/4	+25.0
O	COMPUTER OIMENSIONS	6- 14	6	-1 1/4	-17.2
O	COMPUTER OYNAMICS	1- 4	1 1/4	0	0.0
O	COMPUTER NETWORK	4- 7	6	- 1/2	-7.6
N	COMPUTER SCIENCES	6- 10	6 1/4	- 1/4	-3.8
O	COMPUTER TECHNOLOGY	4- 8	4	0	0.0
O	COMPUTER USAGE	8- 14	8 1/2	- 1/8	-1.4
O	COMP AUTOMOT REPORTS	5- 9	5 5/8	0	0.0
N	COMPUTING & SOFTWARE	15- 28	17	+1 3/8	+8.7
O	COMRESS	1- 3	1 5/8	0	0.0
O	COMSHARE	5- 10	7 3/4	0	0.0
O	OATATAB	5- 9	5 1/8	- 1/8	-2.3
O	EOP RESOURCES	3- 8	2 1/2	-1 1/4	-33.3
A	ELECT COMP PROG	2- 5	2 1/8	0	0.0
N	ELECTRONIC OATA SYS.	43- 65	54 1/4	- 3/8	-0.6
O	INFORMATICS	6- 11	6 7/8	0	0.0
O	I.O.A. OATA CORP	1- 3	2	0	0.0
O	KEANE ASSOCIATES	4- 7	4 1/4	0	0.0
O	KEYOATA CORP	7- 13	13 1/8	+1 1/8	+9.3
O	LOGICON	4- 9	5 7/8	0	0.0
A	MANAGEMENT OATA	6- 10	6 1/8	+ 1/4	+4.2
O	NATIONAL CSS INC	8- 28	24 3/4	+ 1/8	+0.5
P	ON LINE SYSTEMS INC	8- 20	19 1/2	-1 1/8	-5.4
N	PLANNING RESEARCH	10- 17	10	- 1/4	-2.4
O	PROGRAMMING METHOOS	20- 24	22	+ 1/4	+1.1
O	PROGRAMMING & SYS	1- 2	1 1/2	+ 1/8	+9.0
O	SCIENTIFIC COMPUTERS	2- 4	2 1/4	0	0.0
O	SIMPLICITY COMPUTER	1- 5	3 3/4	0	0.0
O	TBS COMPUTER CENTERS	4- 6	4 5/8	0	0.0
O	TRACOR COMPUTING	1- 3	1 3/8	- 1/8	-8.3
O	TYMSHARE INC	7- 11	10 1/8	- 5/8	-5.8
O	UNITEO DATA CENTER	5- 8	6	-1 1/4	-17.2
N	UNIVERSITY COMPUTING	14- 26	13 3/4	-1	-6.7
A	URS SYSTEMS	6- 10	8 3/4	+ 1/8	+1.4
O	VORTEX CORP	2- 5	3 3/4	+ 1/4	+7.1
	PERIPHERALS & SUBSYSTEMS				
N	ADDRESSOGRAPH-MULT	34- 49	42 3/4	-3 1/4	-7.0
O	ADVANCED MEMORY SYS	12- 23	15 1/2	-2 1/2	-13.8
N	AMPEX CORP	6- 15	6 1/2	+ 1/4	+4.0
O	ANDERSON JACOBSON	5- 8	4 3/4	- 1/8	-2.5
O	ATLANTIC TECHNOLOGY	1- 11	2	- 3/4	-27.2
A	BOLT,BERANEK & NEW	5- 21	18 3/4	- 7/8	-4.4
N	BUNKER-RAMO	9- 14	11	- 5/8	-5.3
A	CALCOMP	13- 25	13 1/4	+ 1/8	+0.9
O	CENTRONICS DATA COMP	11- 53	49	+8	+19.5
O	COGNITRONICS	3- 5	3 1/4	- 1/4	-7.1
O	COMPUTER COMMUN.	1- 7	2 7/8	+ 3/8	+15.0
A	COMPUTER EQUIPMENT	3- 4	2 7/8	+ 1/8	+4.5
O	COMPUTER MACHINERY	7- 13	9 1/4	- 1/4	-2.6
A	COMPUTEST	4- 9	4 3/8	+ 1/8	+2.9
A	DATA PRODUCTS CORP	4- 7	3 3/4	- 1/4	-6.2
O	DATA RECOGNITION	1- 5	1 1/4	- 3/4	-37.5
O	DATA TECHNOLOGY	2- 5	2 5/8	+ 1/4	+10.5
O	DI/AN CONTROLS	0- 8	5 1/4	+ 1/4	+5.0
O	DIGITRONICS	2- 4	2 3/4	+ 1/4	+10.0
N	ELECTRONIC M & M	4- 8	4 3/8	+ 3/8	+9.3
O	FABRI-TEK	2- 5	3 3/4	+ 1/8	+3.4
O	GENERAL COMPUTER SYS	7- 16	11	- 1/2	-4.3
N	GENERAL ELECTRIC	59- 70	64 7/8	-2 1/8	-3.1
N	HAZELTINE CORP	9- 13	9 1/4	- 1/4	-2.6
O	INFOREX INC	21- 36	26 1/2	+ 1/2	+1.9
O	INFORMATION DISPLAYS	1- 5	2 1/8	+ 5/8	+41.6
A	LUNOY ELECTRONICS	9- 14	10 1/4	- 1/4	-2.3
O	MANAGEMENT ASSIST	1- 2	1/2	- 1/8	-20.0
N	MEMOREX	18- 38	18 3/8	-1 3/8	-6.9
A	MILGO ELECTRONICS	17- 44	26 1/8	- 7/8	-3.2
N	MOHAWK DATA SCI	17- 27	16 7/8	-2	-10.5
O	OPTICAL SCANNING	7- 16	11 3/4	+ 3/4	+6.8
O	PERTEC CORP	8- 17	8 1/2	-1	-10.5
O	PHOTON	7- 15	9 1/2	-1 3/8	-12.6
A	POTTER INSTRUMENT	9- 21	10 1/4	- 3/4	-6.8
O	PRECISION INST.	4- 13	4	-2	-33.3
O	RECOGNITION EQUIP	8- 15	7 3/4	- 3/4	-8.8
N	SANOERS ASSOCIATES	13- 21	14 1/2	- 1/2	-3.3
O	SCAN OATA	7- 13	8 3/4	+ 1/8	+1.4
O	STORAGE TECHNOLOGY	17- 39	32 1/8	+2 3/8	+7.9
O	SYCOR INC	7- 11	10	-1	-9.0
O	TALLY CORP.	8- 15	10 3/4	- 1/8	-1.1
N	TEKTRONIX INC	34- 64	55	-2	-3.5
N	TELEX	6- 15	7 1/2	0	0.0
O	WILTEK INC	10- 26	17 1/2	+1	+6.0
	SUPPLIES & ACCESSORIES				
O	BALTIMORE BUS FORMS	6- 9	5 3/4	- 1/4	-4.1
A	BARRY WRIGHT	9- 14	13 1/8	+ 1/4	+1.9
A	OATA DOCUMENTS	17- 26	20	+ 7/8	+4.5
O	OUPLEX PRODUCTS INC	8- 16	8 1/4	0	0.0
N	ENNIS BUS. FORMS	7- 10	7 3/8	+ 1/2	+7.2
O	GRAHAM MAGNETICS	15- 27	18 1/2	+ 1/4	+1.3
O	GRAPHIC CONTROLS	12- 15	12 1/2	0	0.0
N	3M COMPANY	76- 85	78 3/4	-5 3/4	-6.8
O	MOORE BUS. FORMS	42- 56	55 3/4	- 3/4	-1.3
N	NASHUA CORP	48- 62	61 1/2	+1 3/8	+2.2
O	REYNOLDS & REYNOLD	37- 77	42 3/4	-2 1/4	-5.0
O	STANOARD REGISTER	14- 20	17 7/8	+1 1/8	+6.7
O	TAB PRODUCTS CO	14- 17	16 1/2	0	0.0
N	UAPCO	22- 28	23 1/8	+1 3/8	+6.3
A	WABASH MAGNETICS	7- 11	8	- 1/4	-3.0
N	WALLACE BUS FORMS	22- 26	22	- 3/8	-1.6
	COMPUTER SYSTEMS				
N	BURROUGHS CORP	147-226	209	-6 7/8	-3.1
N	COLLINS RADIO	14- 20	15 3/8	+ 1/4	+1.6
N	CONTROL OATA CORP	43- 78	74 1/8	- 5/8	-0.8
O	OATA GENERAL CORP	56-115	100 1/2	-3 1/2	-3.3
O	DIGITAL COMP CONTROL	9- 25	10	+ 1/4	+2.5
N	DIGITAL EQUIPMENT	72-101	89	-6	-6.3
N	ELECTRONIC ASSOC.	6- 13	9 3/4	- 1/2	-4.8
A	ELECTRONIC ENGINEER.	7- 14	7 1/8	- 5/8	-8.0
N	FOXBORO	26- 41	28 3/4	-1 1/2	-4.9
O	GENERAL AUTOMATION	13- 35	33 1/2	+1 1/2	+4.6
O	GRI COMPUTER CORP	3- 5	3 7/8	- 1/8	-3.1
N	HEWLETT-PACKARO CO	46- 77	71 1/8	-2 3/8	-3.2
N	HONEYWELL INC	130-170	152 7/8	-6 3/8	-4.0
N	IBM	333-426	407 1/4	-6	-1.4
O	INTERDATA INC	8- 16	12 5/8	- 5/8	-4.7
O	MICRODATA CORP	5- 10	9 1/4	+1 1/2	+19.3
N	NCR	29- 36	34 3/8	+2	+6.1
N	RAYTHEON CO	32- 47	33 3/4	+ 1/2	+1.5
N	SPERRY RANO	30- 48	44 1/2	-1 7/8	-4.0
A	SYSTEMS ENG. LABS	10- 16	10 5/8	- 3/8	-3.4
N	VARIAN ASSOCIATES	14- 22	20 1/8	-1 1/8	-5.2
N	VICTOR COMPTOMETER	15- 24	20 3/4	- 1/2	-2.3
N	WANG LABS.	34- 61	36 3/8	-3 5/8	-9.0
N	XEROX CORP	121-172	158 3/4	-5 7/8	-3.5
	LEASING COMPANIES				
A	BOOTHE COMPUTER	5- 18	6	- 1/8	-2.0
O	BRESNAHAN COMP.	2- 3	2 1/4	+ 1/8	+5.8
O	COMOISCO INC	3- 18	16	0	0.0
O	COMPUTER EXCHANGE	1- 3	1 1/8	- 1/8	-10.0
A	COMPUTER INVSTRS GRP	8- 14	9 7/8	+ 1/4	+2.5
N	OPF INC	5- 13	6 1/4	+ 1/2	+8.6
M	DATRONIC RENTAL	2- 4	1 7/8	- 1/8	-6.2
A	DCL INC	5- 10	5	+ 1/8	+2.5
A	DEARBORN-STORM	17- 26	16 5/8	- 1/2	-2.9
A	DPA, INC.	5- 8	5 3/4	0	0.0
A	GRANITE MGT	6- 11	5 7/8	- 3/8	-6.0
A	GREYHOUND COMPUTER	6- 11	6 3/8	- 1/2	-7.2
A	ITEL	7- 12	9	0	0.0
N	LEASCO CORP	17- 24	20 5/8	- 7/8	-4.0
O	LEASPAC CORP	9- 15	9 1/4	- 1/4	-2.6
O	LECTRO MGT INC	1- 4	1 1/4	0	0.0
O	NCC INDUSTRIES	6- 11	5 7/8	- 1/4	-4.0
A	ROCKWOOD COMPUTER	2- 7	3	+ 1/4	+9.0
O	SYSTEMS CAPITAL	3- 20	14 1/2	+1 3/4	+13.7
N	U.S. LEASING	19- 33	31 1/2	+1	+3.2

EXCH: N=NEW YORK EXCHANGE; A=AMERICAN EXCHANGE
L=NATIONAL EXCHANGE; O=OVER-THE-COUNTER
P=PHIL-BALT-WASH
O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

Computer Stocks Trading Index

—— Computer Systems ----- Software & EDP Services
.... Peripherals & Subsytems .... Leasing Companies
—— Supplies & Accessories -·-·- CW Composite Index



Earnings Reports

RAPIDATA
Three Months Ended June 30

	1972	1971
Shr Ernd	$.14	$.11
Revenue	2,014,744	1,419,625
Tax Cred	.....	11,750
Earnings	264,376	173,682
6 Mo Shr	.24	.19
Revenue	3,718,510	2,629,390
Tax Cred	.....	74,070
Earnings	452,735	317,056

INTERNATIONAL COMPUTER
Three Months Ended May 31

	1972	1971
Shr Ernd	$.10	.....
Revenue	191,596	$18,609
Earnings	157,748	468

VARIAN
Three Months Ended June 30

	1972	1971
Shr Ernd	$.16	$.09
Revenue	52,537,000	47,157,000
Earnings	1,180,000	546,000
9 Mo Shr	.29	.....
Revenue	150,408,000	138,043,000
Spec Item	258,000	a(2,486,000)
Earnings	2,105,000	b(7,336,000)

a-Consists of $786,000 charge to conform to accounting methods of affiliated companies and $1.7 million charge for relocation of facilities. b-Includes special loss provision of $5.2 million after taxes for revaluation of assets relating primarily to inventories, receivables, contingencies, tooling and similar deferred costs.

PROGRAMMING & SYSTEMS
Three Months Ended May 31

	1972	1971
Shr Ernd	$.05	$.02
Revenue	1,484,182	1,210,605
Earnings	147,139	45,874

COMMUNICATIONS SATELLITE
Three Months Ended June 30

	1972	1971
Shr Ernd	$.61	$.55
Revenue	25,618,000	22,229,000
Earnings	6,070,000	5,454,000
6 Mo Shr	1.26	1.21
Revenue	50,858,000	44,163,000
Earnings	12,566,000	12,145,000

CONRAC
Three Months Ended June 30

	1972	1971
Shr Ernd	$.43	$.33
Revenue	14,819,501	11,763,663
Earnings	580,664	450,145
6 Mo Shr	.81	.62
Revenue	28,654,921	23,778,297
Earnings	1,099,977	858,839

DATA PRODUCTS
Three Months Ended June 24

	1972	1971
Shr Ernd	$.05	$.01
Revenue	13,927,000	13,359,000
Loss Disc Op	.....	30,000
Tax Cred	163,000	.....
Earnings	349,000	90,000

BUNKER-RAMO
Three Months Ended June 30

	1972	1971
Shr Ernd	$.13	$.04
Revenue	64,652,950	60,597,058
Earnings	3,260,965	1,468,159
6 Mo Shr	.23	.02
Revenue	125,642,857	113,097,771
Earnings	5,747,569	1,791,269

MOHAWK DATA SCIENCES
Year Ended April 30

	1972	a1971
Revenue	$119,795,000	.....
Spec Chg	295,000	.....
Loss	765,000	.....

a-Comparable figures not available due to change in fiscal year.

When the roll is called up yonder-we'll be HERE!

...IN SPITE OF DEADLY TIMES for companies in the computer industry, MANAGEMENT SCIENCE AMERICA, INC. survived the economic grave that claimed many of our blood brothers. We did it through dedicated employees, eight proven products, and 350 proud users who spirited the continued growth and development of our software packages through active user groups...

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- ☐ FIXED ASSETS
- ☐ ACCOUNTS PAYABLE
- ☐ INVENTORY CONTROL
- ☐ INSTALLMENT LOANS
- ☐ TIME DEPOSITS

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

COMPUTER_____

TELEPHONE NUMBER_____

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